PAY as you SEE TV

by Ira Kamen

A Howard W. Sams PHOTOFACT PUBLICATION KA-1

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PAY *as you* SEE TV

by Ira Kamen

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KA-1

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DEDICATION

"This book is dedicated to Carrington Raymond, Headmaster of the Barnard School for Boys in New York City, and other educators who selflessly have devoted their lives to decoding the minds of our sons in their democratic pursuit for knowledge, human understanding, and happiness."

Ira Kamen

PUBLISHER'S NOTE

The subject of Subscription TV has recently received a great deal of attention within the industry. Opinions regarding possible approval of a system, or systems, by the FCC are divided, ranging from enthusiastic "pros" to unimpressed "cons."

Proof of success or failure and degree of need can only be demonstrated by practical application; therefore, short of these determinations, status of the subject must remain conjectural and, to a great extent, controversial.

In presenting this book, which describes systems under consideration at the present time, the publisher admits to no opinion and seeks only to provide useful information primarily intended for the technician, but of help to the layman as well, to assist in understanding the origin and basic operational factors of these systems.

FOREWORD

The author has made every effort to present the subscription TV story in as objective a manner as was possible with the information made available to him by the various proponents of subscription TV.

While he was influenced by the writings, conversations, and correspondence with such individuals as Millard Faught, Arthur Levey, Carl Leserman, Dr. Louis Ridenour, Milton "Jerrold" Shapp, Jay and Arnold Wells, Jack Poppele, Dr. Frank Warren, and many others, he has gleaned heavily from his own experience as a consultant, engineer, and advisor to those engaged in various phases of subscription television.

The author freely admits that he is biased toward subscription television. With all his heart he believes that subscription television must come — and will soon be a part of the American scene.

This book has been prepared in what the author hopes is an easy reading style, so that the non-technical reader can learn the story of subscription television as easily as the trained technician. Only those chapters and paragraphs pertaining to the specific design of the electronic equipment contain data which cannot be understood by the layman. It is hoped that the lay reader will pass through the technical copy knowing that these systems work, and that the economics of the story are based upon the fact that all the systems which have been proposed and demonstrated, perform satisfactorily.

This text should also be valuable to those who want to become a part of the forthcoming subscription TV industry, providing they can place themselves in the same mental condition as the hydraulic engineer who need not know that water is H_2O in order to make water work profitably for him.

Subscription TV is surrounded by people of genius, with indisputable records of success which should breed success if the FCC approval is granted and when the motion picture industry enthusiastically supports subscription television.

This book could not have been prepared without the cooperation of the publicity directors (Jane Temple, Jack Ryan, William Baltin) of the various subscription TV corporations and the photography of one William Kirby.

Ira Kamen

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INTRODUCTION

Most people have heard of the television business known as subscription or pay-as-you-see TV. Subscription TV is a proposed system which would bring to the viewing audience the latest motion pictures, Broadway plays photographed directly from their New York stages, first-class sporting events, and many other forms of entertainment and education which TV stations are not telecasting, either because of high cost or contractual problems. Subscription TV would make it possible to broadcast these otherwise unavailable attractions by allowing the viewer in his home to pay for each one he watches, just as if he were buying a ticket. Obviously, when each viewer pays for what he watches, high costs of talent and production can be covered — and much more than covered, for the same reason that a theater-owner can make profits for producers simply by letting in only those who pay for tickets.

The deal is a good one for the viewer, too. True, he has to pay for entertainment instead of watching free, but he pays for only those attractions he sees — the rest of the time he can watch the usual free shows. But those he does pay for and watch, he enjoys in the comfort of his living room, without moving a step, with his family and his friends. The refrigerator is handy; he doesn't have to dress — you can see the advantages in "attending" at home, the shows and sports you would otherwise have to make a special trip to attend.

Of course, you can't put a show on the air and then trust people either to pay or to turn to another station! So a special transmission and reception method is used with subscription TV. The picture is sent out over the air in such a way that ordinary TV sets cannot receive it well enough to watch and enjoy the program. The picture may flicker badly, the colors may be reversed like a photographic negative, the scenes may appear upside down, or any of many other ways may be used to insure that those who are not subscribers cannot watch.

Each subscriber gets a small "decoder" which is attached to his set. He doesn't have to have any special kind of set — the set he uses now will work very well with subscription TV — but only after the decoder is installed! After that, whenever he wants to watch one of the special programs, he simply tunes in the program and properly stimulates the decoder with a key, a card, a telephone connection, or a coin (depending upon the system). The decoder then clears up the picture for comfortable enjoyment.

The subscription TV systems seem simple and workable — and they are. Of course, a good deal of technical development has been going on to make it possible, but for the set owner it will be about as simple as it sounds.

Subscription TV is not being proposed as a substitute for advertising-sponsored TV. It is being offered as a lower-cost method of providing better entertainment for the American Public by eliminating secondary costs such as driving, parking, and baby sitters.

It must be understood that subscription TV's special events can only provide a small portion of the national TV program material. Consider the following analysis prepared by the Telemeter Corp.:

EVENTS per year	Approximate hours
Motion Pictures (based on production in top year)	600
Big League baseball-all American and National league games	900
NCAA Collegiate football games	800
Championship Fights, Special events - Indianapolis Race, Kentucky Derby, All-Star Charity Show, etc.	200
Approximate Total	2500

In New York City we now use over 36,000 hours of programming time in a year. This means that, at the best, in the big cities only a small percentage of the time could be consumed by subscription TV service. We shall see, however, in the analysis which follows, why this service is of paramount interest in those areas not served by network TV.

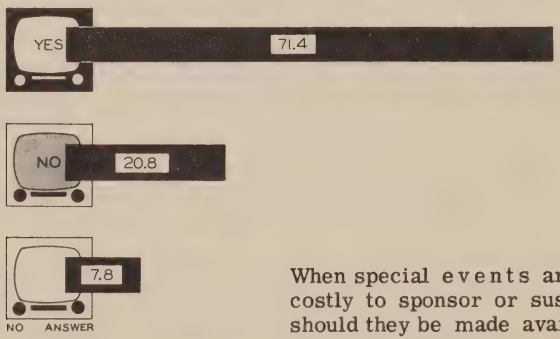

YES
71.4
NO
20.8
7.8
NO ANSWER
When special events are too costly to sponsor or sustain, should they be made available to the televiewer for a fee?

Fig. 1. Tele-Census Survey of May, 1954 in Los Angeles, Conducted By College Students and Their Instructors.

Surveys have shown that the TV viewer would prefer to pay for special programs in his home, rather than pay for attending a special event or movie in a theater. Fig. 1 shows the recent Tele-Census report prepared in Los Angeles, under the supervision of Professor Hal Evry.

The author will now present the case as to why subscription TV must become a part of the American free-enterprise system in the cultural and economic development of our national television entertainment.

SECTION I

WHY SUBSCRIPTION TV

Since its inception, radio broadcasting has been sponsored by advertising. It was normally assumed by everyone that with the advent of television, it too would receive its economic support from the same source. However, after a period of years of operation, an analysis between these two great mediums indicates that they have more differences than similarities.

To develop a better understanding as to the differences between the two media, radio and television, we must understand that radio's cost per thousand viewers is a great deal less and therefore creates a market for a larger number of advertisers. This is especially true in the small cities where radio stations, which have no network affiliation, are able to operate profitably from local sponsorship. It really is not in the cards for TV to come up with programs which are equivalent in cost with disc-jockey shows, and other radio programming. This leads to the great economic difference between the two media.

The advertiser has a certain specific budget from which he can pay for program material and broadcasting time in order to present his message to the public. In radio it might be said that for $10,000.00 per week he could reach the same number of people which would require a hundred thousand dollar investment if he were to use television. It takes a very substantial organization doing millions and millions of dollars of business to support continual sponsorship of a TV program on a weekly basis. Drawing from the information presented by the Zenith Radio Corp., June 18, 1954, to the Sub-Committee on Communications before the United States Senate, you will see how serious this economic problem has become, and why TV broadcasters are reluctant to construct and operate TV stations in a great number of areas throughout the country.

Fig. 2 shows the cumulative number of homes reached as of May '54. You can see from this table that it is possible for an advertiser using the networks to cover a great portion of the American televiewers by buying service in only a few areas. For example, the advertiser can reach 50% of the American homes by advertising in only 12 markets from New York to Washington, as shown in Fig. 2. With this fact as part of the network's sales pitch with national advertisers, it is very easy to convince the advertiser to spend his

Market	Number of Unduplicated TV Homes	Cumulative Number of TV Homes	Cumulative Percentage of Total US TV Homes
1. New York	3,706,800	3,706,800	13.0
2. Chicago	1,630,400	5,337,200	18.7
3. Los Angeles	1,583,200	6,720,400	24.3
4. Philadelphia	1,450,000	8,370,400	29.4
5. Boston	1,113,800	9,484,200	33.3
6. Detroit	972,100	10,456,300	36.7
7. Cleveland	864,100	11,320,400	40.2
8. San Francisco	682,900	12,003,300	42.1
9. Pittsburgh	660,300	12,663,600	44.1
10. St. Louis	567,900	13,231,500	46.5
11. New Haven	518,400	13,749,900	48.2
12. Washington	500,800	14,250,700	50.0
13. Baltimore	463,000	14,713,700	51.7
14. Minneapolis-St. Paul	420,800	15,134,500	53.1
15. Milwaukee	432,200	15,566,700	54.6
16. Indianapolis	406,600	15,973,300	56.1
17. Cincinnati	392,300	16,365,600	57.4
18. Atlanta	358,200	16,723,800	58.7
19. Buffalo	335,000	17,058,800	59.9
20. Kansas City	328,300	17,387,100	61.0
21. Providence	327,500	17,714,600	62.2
22. Charlotte	306,000	18,020,600	63.2
23. Dallas	303,800	18,324,400	64.3
24. Seattle	302,000	18,626,400	65.4
25. Columbus	295,800	18,922,200	66.4
26. Schenectady-Albany	291,100	19,213,300	67.4
27. Galveston	252,500	19,465,800	68.3
28. Memphis	246,800	19,712,600	69.2
29. Houston	244,700	19,957,300	70.0
30. Toledo	227,500	20,184,800	70.9
31. Dayton	223,200	20,408,000	71.6
32. Louisville	214,300	20,622,300	72.4
33. Rochester, N.Y.	211,800	20,834,100	73.1
34. Syracuse	210,200	21,044,300	73.8
35. Huntington	209,800	21,254,100	74.6
36. Birmingham	197,900	21,452,000	75.3
37. Norfolk	188,400	21,640,400	76.0
38. Omaha	186,700	21,827,100	76.6
39. Oklahoma City	176,200	22,003,300	77.2
40. New Orleans	168,100	22,171,400	77.8
41. San Diego	165,100	22,336,500	78.4
42. Miami	163,700	22,500,200	78.9
43. Rock Island	155,800	22,656,000	79.5
44. Wheeling	154,400	22,810,400	80.0
45. Kalamazoo	147,500	22,957,900	80.6
46. Ames	146,800	23,104,700	81.1
47. Johnstown	145,000	23,249,700	81.6
48. Davenport	144,700	23,394,400	82.1
49. Lansing	141,400	23,535,800	82.6
50. Youngstown	138,100	23,673,900	83.1
51. Nashville	137,300	23,811,200	83.7
52. Greensboro	135,500	23,946,700	84.0
53. Richmond	134,700	24,081,400	84.5
54. Denver	131,000	24,212,400	85.0

Total Number Markets - 54
Total U.S. TV Homes - 28,500,000 as of February 1954

Fig. 2. Cumulative Number of TV Homes Reached (As of May, 1954). Courtesy of Zenith Radio Corp.

money through the network and its required affiliates. For the record, as of May '54 the CBS and NBC required and optional affiliates are shown in the following:

	Required Affiliates	Optional Affiliates
CBS	43	57
NBC	52	119

The advertiser must take the required affiliates and he can, at his own choice, pick up coverage from the network's optional affiliates. Experience has shown that most national advertisers use less than 75 stations to cover the country. Fig. 3 lists the top TV programs

Program	No. of Stations	(Coverage of TV Homes) % U.S. Total	TV Homes Covered	Network
Adventures of Ozzie & Harriet	69	94.5	26,730,000	ABC
Arthur Godfrey & His Friends (Pillsbury)	92	96.1	27,190,000	CBS
Arthur Godfrey & His Friends (Toni)	126	97.1	27,470,000	CBS
Arthur Murray Party	36	73.3	20,740,000	NBC
Beat the Clock	66	86.7	24,530,000	CBS
Buick - Berle Show	121	93.6	26,480,000	NBC
Colgate Comedy Hour	106	96.8	27,380,000	NBC
Dragnet	107	96.5	27,310,000	NBC
Garry Moore Show (Kellogg Co.)	52	90.9	25,710,000	CBS
Garry Moore Show (Norge)	105	93.7	26,510,000	CBS
Guiding Light	65	96.1	27,190,000	CBS
I Love Lucy	132	97.8	27,680,000	CBS
Mama	44	87.1	24,640,000	CBS
Martin Kane	65	94.8	26,820,000	NBC
Meet Mr. McNulty	39	79.0	22,350,000	CBS
Our Miss Brooks	49	83.0	23,470,000	CBS
Person to Person	39	38.9	11,000,000	CBS
Plain Clothesman	24	69.3	19,610,000	DuMont
Robert Montgomery	94	96.1	27,190,000	NBC
Rogers & Hammerstein	53	60.7	17,170,000	ABC
Rogers & Hammerstein	92	87.5	24,740,000	CBS
Rogers & Hammerstein	16	34.7	9,820,000	DuMont
Rogers & Hammerstein	94	95.1	26,900,000	NBC

Fig. 3. Coverage of Leading TV Programs. Two Weeks Ending April 10, 1954. Courtesy of Zenith Radio Corp.

and the number of stations which the advertisers have selected for their coverage of TV homes. The one Garry Moore Show realizes a coverage of almost 26,000,000 viewers with a network of 52 stations. The I Love Lucy program uses 132 stations in order to reach over 27,000,000 homes. It can therefore be concluded that the TV stations in the metropolitan areas profit first, while the stations in the secondary areas receive only the crumbs from the national advertisers.

However, the decisions of advertisers to confine their programs to the metropolitan areas are based upon sound business principles.

To indicate the limited support available from advertising, it should be noted that only 52 advertisers in 1953 had a TV advertising budget exceeding 1,000,000 dollars. Certainly then, it is not surprising that approximately 35% of network TV advertising was paid for by only ten sponsors. Because of this problem, and the constant increase in cost for TV time (it has almost doubled from 1951 to 1954) new TV station grants throughout the country are going begging.

As of May 19, 1954, a total of 12 VHF and 61 UHF stations have returned their construction permits or went off the air. The following table classifies these stations in terms of population coverage:

Metropolitan Population of City in which Station is Located (Includes County Population)	VHF	UHF
1,000,000 or over	--	1
900,000 to 1,000,000	--	1
800,000 to 900,000	--	3
700,000 to 800,000	--	--
600,000 to 700,000	--	--
500,000 to 600,000	--	5
400,000 to 500,000	--	2
300,000 to 400,000	--	1
200,000 to 300,000	--	5
100,000 to 200,000	2	22
50,000 to 100,000	5	15
25,000 to 50,000	5	6
Total	12	61

The following table compares, by population groups, the number of channels assigned, and the number of channels covered by license applications, as of May, 1953:

City Size	No. of channels assigned (1)	No. of channels applied for (2)	Percent (2) of (1) (3)
Under 5,000	161	2	1.2
5,000-10,000	395	18	4.6
10,000-25,000	436	82	18.8
25,000-50,000	262	144	55.0
50,000 and over	539	473	87.8
	1793	719	

We can assume that the failure of VHF and UHF stations to stay on the air, is due to the same economic problem as we have previously described. Many UHF broadcasters have united to request the FCC

to approve the pay-as-you-see media as their source of income for economic survival. However, this problem is not only a UHF problem. It is a TV problem in which it has been proven that stations cannot survive without network support. It is not the band of operation that is the solution to the problem, but the national economics involved in profitable TV broadcasting. We shall explain later how the educational TV stations have, up to now, been a dismal flop, largely because very few people, institutions, or State Governments are willing to solve the economic problem by footing the bills of TV station operations. Small communities cannot support TV on the basis of the returns received from advertisers. There must be a dual source of revenue in which the people of the community help to pay for the TV service.

As new developments, such as color TV, are brought forth for commercial use, the higher costs to advertisers will further limit their operations. If TV is to be nationwide and available in all communities, the economics of TV station operation must be freed of their dependency on networks. Considering the American habit of not paying for communications services directly; everyone should realize that indirectly he is paying for the so-called "free" entertainment. The advertiser's budget is pro-rated into the cost of his product; every product purchased by American consumers has some advertising cost. Therefore, it may be said, that subscription TV is actually fairer to the American consumer, since he pays directly, at his own choice, for quality programs which are not available now on TV. Everyone is used to paying for his newspaper. Certainly we know that the fee paid for the newspaper does not cover the cost of its production. Newspapers and magazines sometimes cost four or five times the fee paid directly by the subscriber. Therefore in the newspaper media, the American public is already adjusted to paying a portion of the cost of providing this printed service.

It is the author's opinion that there will be an overall demand for subscription TV, not only by those communities which have been deprived of TV, but from those metropolitan areas which will be deprived of high-quality programs and special events.

Educational TV and Subscription TV

To quote from the world famous economist, Dr. Millard Faught, president of the Faught Company, in his April 6, 1954 speech before the small Business Men's Association in Washington, D. C. : "providing TV sets with a cash register seems to me to be a natural solution to the frustrating situation in educational television. I say "frustrating" because the FCC has set aside 264 of its allocations for educational television stations, acceeding to the almost unanimous recognition that TV is the greatest educational advance since the invention of printing. But, after 2 years, only 4 educational stations are on the air, with hopes for perhaps 20 more. The stumbling block is again economics. TV is costly, along with its versatility. But with an opportunity to collect tuition via subscription TV for a few outstanding programs each week, an educational station would have the funds to operate many more hours per week on a truly free public

service basis; opening for all the public the storehouses of knowledge that now serve only those who can travel to a campus, library, or other cultural center".

Here are the typical costs which show the impractical financial burden which the educational institutions must assume if they are to sustain operation of a TV station.

Equipment for an Educational TV Station:

Transmitter (500 watts) facility complete with antenna . . .	$150,000
TV recording Equipment	35,000
Film and projection equipment	115,000
Total Capital Investment	$300,000

Estimated Yearly Cost of Operating an Educational TV Station:

Transmitter, staff, and replacement parts	$ 30,000
Studio-complete technical staff	50,000
Management and operating staff	60,000
Program material and preparation	75,000
Total	$215,000

Currently, the only sources of finances are grants by idealistic industrialists like Benjamin Abrams, President of the Emerson Radio Corporation; the various foundations like Ford; and voluntary contributions. The educators cannot make a go of it unless they are assured more stable financial support than the forementioned.

The author, in April, 1953, made a study of this knotty problem, and prepared a plan by which the educators could, with the use of Pay-as-you-see TV, lick the economic aspects of their situation. This so-called "Kamen Plan" takes into consideration the psychological, economic, and social problems involved in adult education. The plan rationalizes that men and women in almost every occupation would benefit by authentic, practical instruction and indoctrination, to improve their knowledge and capabilities in their jobs. A large proportion of these people do not attend such courses because:

a. They cannot afford the time, or do not wish to leave their families for the necessary time.

b. A very small number of courses directly pointed at increase of job capability are offered, and most of these are in the few largest cities.

c. An important deterrent is the distance which must be traveled to each session of a course, and the time consumed in travel.

d. The "self-induced" action required by a person to locate a good course, investigate the ramifications, fill out the forms, arrange for the required engagement-free nights on a regular basis, and even

merely to make up his mind to do it is blocked by the kind of inertia most people have in beginning anything out of the ordinary.

This plan features the use of merchandising techniques, plus a novel technical distribution system. The plan provides for the setting up of a network of educational stations, which would transmit educational programs only.

During a large percentage of operating hours there would be courses telecast, in which either the audio and/or video would be scrambled. Students who wish to participate in one or more courses would apply for the small decoder, available on a course-fee basis.

Costs for any course would, over a period of time, decline below the original presentation cost. Each session could be recorded on film, and repeat presentations of the course in the same area, or presentation in other areas, would thus involve no cost other than film prints.

The stations would also broadcast a series of programs without charge, which would not involve the scrambling technique. The proposal also notes that the majority of courses presented on the pay-as-you-learn plan would be of a day-to-day usefulness type, as well as college credit courses. Typical courses could be: Supervising Manpower, Better Salesmanship, Business Personality Improvement, Operating a Small Business, Starting a Business, Theory and Practice of Transistors, Maintaining Your Automobile, Repairing Home Appliances, etc. Obviously this list can be multiplied many times, extending to both specialties and necessities common to the requirements of the majority of the people.

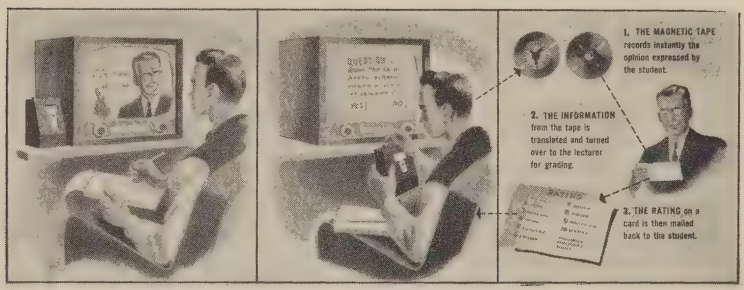
The educational plan also covers the personnel, and the training equipment that would be issued. Visual aids would be featured. Courses would be given, not only by professional educators, but wherever possible, by outstanding practicing members of the business and professions involved. During each course, several typical individuals who are in positions to approve, buy from, sell to, and otherwise deal with students, would be presented.

Each course session could be attended in the studio by a small group of students, who would answer instructor's questions, make comments, and contribute to the instruction by representing all the students who are at home. Special equipment, structures, and locations would play quite a role in this plan. For example, films and TV cameras could be very helpful in a course on understanding atomic energy; the camera could bring the student to, and inside, such atomic gear as a cyclotron.

To stimulate interest in the plan, a continuing promotional program is suggested. Booklets would be mailed to each student to accompany the course. These would contain a brief outline of each session; statistical, graphical, and similar information for permanent retention; tear-out, five-questions, multiple-choice quiz for

completion, and mailing after each session. Question would revolve about situations so that parrot-like learning would not suffice. Based on the information given in each session, the student would be required to state his procedure under certain circumstances. A tear-out examination for the end of the course would also be provided.

According to the plan, each student would receive a certificate for the courses satisfactorily completed. So that these certificates might carry some recognition and perhaps be used to establish subject familiarity in seeking employment or a promotion, some type of state approval of the certificates might be sought, the plan suggests. Adoption of this type of pay-as-you-learn scheme, properly administered, could be the answer to those dollar problems posed by all educators.


1. THE MAGNETIC TAPE records instantly the opinion expressed by the student.
2. THE INFORMATION from the tape is translated and turned over to the lecturer for grading.
3. THE RATING on a card is then mailed back to the student.
RATING

1. An instructor, via television, lectures the student at home who has subscribed and paid for the course via Telemeter.

2. At the end of the course the lecturer asks questions via the TV screen that can be answered by the student with Telemeter's "yes" or "no" Answer Button.

3. The student's answers, recorded on the Telemeter tape, go to the instructor who grades them and sends the results to the student.

Fig. 4. International Telemeter Corp.'s Proposal for the Practical Operation of Educational TV.

Fig. 4 shows International Telemeter Corporation's proposal for the practical operation of Educational TV, using their pay-as-you-see principles and devices.

While TV will not replace the teacher, it will make the words of great educators available to students who are in areas far from the source of the original broadcast.

Education is well founded in the American concept. All educators are agreed that TV will make a better informed citizenary, and that TV is an effective educational medium.

Limited experience has shown that teachers on TV are under close scrutiny, and make an "on-their-toes" effort like all other TV performers. Many educational establishments, as a compromise, have developed the application of closed circuit or wired TV, which does not require the use of station equipment and personal. International Telemeter in May, 1954, demonstrated in New York City, a low cost miniature closed circuit TV system complete with camera for use in classrooms and study halls. But this is a minor application

for TV training. The real role of educational TV is to bring this great cultural medium to the home.

Probably one of the greatest applications of educational TV was demonstrated by the Skiatron Electronics Corporation on October 21, 1953, when the latest radiological treatment was telecast with demonstrations on an actual patient, to hundreds of doctors assembled in New York and New Jersey. With the advent of color TV, there is no limit to the medical data which could be transmitted. Most doctors would be glad to pay for this data which would eliminate long trips to metropolitan areas, where he cannot see as much as he could under the sharp eyes of the color TV camera.

During Skiatron's demonstration new medical weapons which are beneficial by-products of the manufacture of atomic bombs, to be used by doctors against such deadly diseases as cancer and leukemia, were demonstrated over television during the twenty-sixth annual Graduate Fortnight of the New York Academy of Medicine.

During this experimental air telecast, a Skiatron device was employed to restrict the clinical programs for doctors to authorized receivers. The important sections of this demonstration were telecast in "scrambled" form over WOR-TV, so that they were unusable for public viewing on Channel 9.

This demonstration was designed to show the physicians how they might receive clinical instruction and guidance in the confines of their homes or office without taking costly time to go to some lecture hall.

As part of the demonstration, radio active isotopes, brought from the atomic bomb plant at Oak Ridge, Tenn., were shown over the air, with an explanation of how they were received and how they had to be handled. After that, these atomic substances were inserted into the blood stream of the patient (see Fig. 5), in view of the medical audience. The patient was suffering from polycythemia vera, or an over-abundance of red cells in the blood, making circulation difficult. Application of the new atomic medicine in remedying this condition was explained.

At the three medical centers where the demonstrations were given, doctors saw simple Skiatron decodors attached to the television sets. These decoders enabled the viewers to see clearly the programs that were scrambled by the transmission station. Figs. 6A&B shows the coded and decoded pictures of a puncture of a patient's vein.

Dr. Frank Warren, Director Medical Division of Skiatron Corp., and Medical Color TV Consultant to the American Cancer Society, stated during a recent conference that: "Had Aladdin's magic lamp fallen into the hands of an altruistic physician, he could have made no greater wish than to ask for television. Not the television of marching cigarettes, talking beer bottles, and singing soap, but rather

the instrument for the presentations of science. Scrambled image television offers the medical profession many advantages. It brings to the medical program the security of closed circuit transmission without the high cost of cables and telephone lines. Furthermore, it obviates the requirement that the busy doctor come to a central point

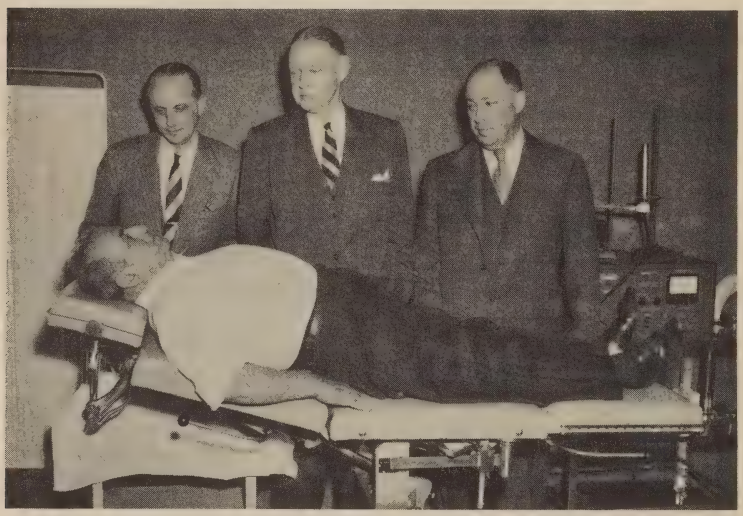


Fig. 5. Pictured During the Demonstration are (Left to Right): Arthur Levey, President of the Skiatron Electronics and Radio Corp.; Dr. Howard Reid Craig, Director of the New York Academy of Medicine; and Dr. Paul Reznikoff, Chairman of the Committee on Graduate Fortnight at the Academy, Grouped at the Side of Patient Angelo D' Angiolillo.

of reception in order to see a confidential program; as is the case with most closed circuit programs. The physician can be reached at home, at his convenience, via his own set since the decoding device can be attached to any standard home TV receiver, black and white, UHF, or color. The coding cards, containing a printed electronic circuit, precludes unauthorized viewing by virtue of the fact that they are difficult to duplicate, and may be changed daily. In effect, the device sets up a private medical network, adaptable, confidential, and inexpensive. Further, the use of a special decoding card enables the medical telecasters to select their physician audience in terms of predominant interest. For instance, suppose 5,000 doctors have closed circuit receivers in their offices, tuned to receive images from a transmitter connected to a camera at a leading polyclinic. If 1,000 of these doctors are surgeons, and a special surgical presentation is being prepared for them alone, then with a scrambling device and a selection card in the closed circuit these 1,000 surgeons can be "selected" to receive the surgical program. The decoding punch-card is mailed out only to them, eliminating other programs and listeners.

"Similar arrangements could be followed for pediatricians, gynecologists, obstetricians, or other groups of specialists. In other works, a scrambler or coder is a device which permits the medical programmer to select his audience. The potentialities of this system are limitless.

"Through the extensive use of TV the medical institutions of the future will be unlimited in their ability to interchange information. Knowledge and ideas will pass freely through the air, between medical schools and hospitals, conference rooms and clinics. This pooling of medical knowledge will undoubtedly result in a general elevation of standards, and inevitably the benefits will be apparent in terms of better health for all".

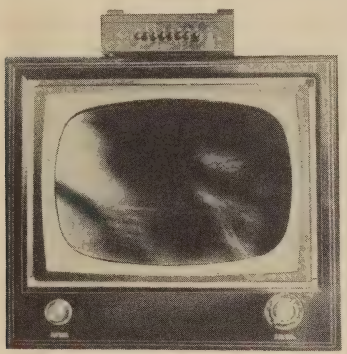


Fig. 6A. Coded Picture of Medical Demonstration as Viewed Before Decoding.

Fig. 6B. Decoded Picture of Medical Demonstration Showing Vein Puncture.

The doctor's statement clearly reflects the enthusiasm of the medical profession for the future of subscription television. How many patients will benefit from the new funds of knowledge which will become available to local doctors with these new horizons for collaboration between the world of medicine and color subscription TV?

Sports and Subscription TV

The promoters of fights, football, baseball, the Kentucky Derby, and other major sports events are eager for subscription TV to become established. The sponsors cannot pick up the tab for the major championship fights. In forty odd theatres around the United States, the Theatre TV rights to the Marciano-LaStarza fight grossed over $325,000. But consider the possibilities if this fight were broadcast over a subscription TV system, and let us say that the fee was 50 cents for this major event. Assuming that the end of 1955 sees forty million TV sets in homes, and perhaps 5,000,000 homes have paid the fee, a potential gross of two and one-half million dollars would be available to the promoters.

In the matter of college athletics it might be well to quote Mr. Robert A. Hall, Chairman of the Board of Athletic Control at Yale University. "The athletic revenues of the nation's colleges are seriously threatened by the adverse affect of TV on football attendance. TV as it is now conducted, constitutes a grave danger to the maintenance of our program of inter-collegiate competitive sports." It is obvious that the old grads would prefer to see their TV in the comforts of their home, rather than pressing into the stadium to sit on the hard, cold benches to cheer for the old team. Subscription TV offers additional income which could be used by the college not only to further athletics, but to further its other activities.

The advertiser is certainly no longer in a position to make up for the difference in gate between those who did attend and those who would have attended if the program had not been telecast. Imagine the revenue that could be realized when a top college team is playing a critical game with perhaps 5,000,000 viewers who have each contributed 25 to 50 cents for the privelege of seeing the game.

From the standpoint of baseball, just imagine the return from 20,000,000 TV set owners who had paid a fee of 25 cents to watch the World Series performance. This return would more than dwarf the gate of the paid admissions. It would be a pleasure to watch a game that was all baseball or all football, without being pressured to light up a cigarette, or drink a glass of beer.

Subscription TV offers a bright future to the sports promoters. It is to be anticipated that the sporting events of the future will make the historic Dempsey-Tunney gate look like minor attractions in the history of sports.

Subscription TV Needs First-Run Movies

The proponents of all the subscription TV systems realize that the success of the subscription TV service depends upon the availability of a quantity of top quality motion pictures. Fortunately, for the future of subscription TV, many of the key executives of the proponents for subscription TV services are motion picture executives. The Paramount interests control the International Telemeter Corp., who have the guiding hands of such people as Carl Leserman and Paul Raibourn. The Chairman of the Board of the Skiatron Corp. is Mr. Matty Fox, a name long associated with the motion picture industry. The President of Skiatron is Mr. Arthur Levey, who also has been associated with the motion picture industry, both here and abroad. Zenith (with Comdr. E. F. McDonald at the helm) has set up a separate corporation known as Teco, whose personnel are devoted to the organization of program material for subscription TV.

All of the people directing the activities in the furthering of the subscription TV art are working towards the establishment of a mutually profitable relationship with the producers in Hollywood. The motion-picture producers are for the most part looking forward to the development of subscription TV. A potential theatre of forty

million people makes Hollywood's future look brighter and greater than in its hey-day in the 20's. To quote some of the leaders; Sam Goldwyn in a recent interview published by U. S. News and World Report, stated; "I think that with paid TV they can take in more money in one night than they can now in 6 months." Ellis Arnall, President of the Independent Motion Picture Producers, said "Essentially TV is motion pictures, and if subscription TV is the way to make them work together, I am for it." The International Telemeter people put it this way: "In movies, in 1939, a man in Hollywood named David O. Selznick produced a collosal movie called "Gone With The Wind." During the first year that this great picture was in distribution, it grossed 13,000,000 dollars, and in the next ten years it piled up a gross of more than $30,000,000. With home box-office TV, Mr. Selznick's "Gone With The Wind" might have grossed more in 10 months than it did in ten years." During the tests of the Zenith Corporation in Chicago, the public opinion poll indicated the desire and willingness of the people to pay for a home box-office TV service at the rate of 1 dollar per show. The Zenith records show that of the 300 test families who had the actual Phonevision service for 90 days, there was a 100% approval to continue the service.

The marginal exhibitors will of course be placed in a precarious position by the adoption of subscription TV. While many advance the arguement that people still like to dress up and get out of the house, it is quite possible that the final adoption of subscription TV will mean still more failing exhibitors. Many exhibitors are transferring their activities to drive-ins, constructing special circular screens, 3D projection, and so on as a means of competing with both "free" and subscription TV.

Paul McNamara, Vice President of International Telemeter Corporation, advanced a unique plan which may be the answer to the exhibitors problem. He recommended, to local TV station broadcasters, cooperation with the local motion picture theatre operators.

He pointed out that "the local TV station may take advantage of this situation in several possible ways, for example:

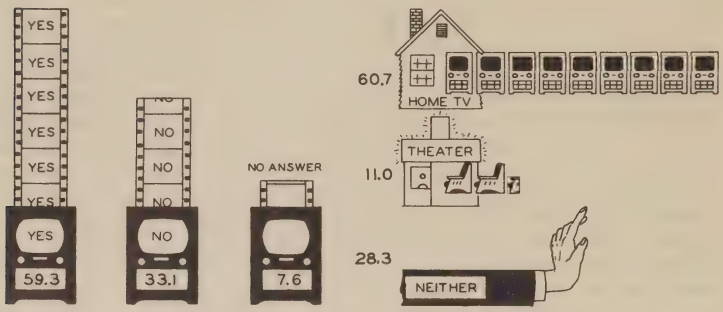
1. The local TV station could sell time to the local theatre operator in order that he may run his picture over the pay-as-you-see system, the theatre operator retaining the balance after Telemeter charges and station time charges have been paid.

2. The station might arrange for some kind of a percentage deal with the local theatre operator — the station providing the time and the theatre operator the program on the basis of some equitable split of the revenue.

3. It may be that the station operator will wish to buy and sell the attractions, via the Telemeter system, himself.

If such a suggestion could be put into effect, it would provide local stations with a quantity of quality programming that would go far to meet their unique economic and programming problems."

The surveys (Fig. 7) have shown that the public would prefer to see their first-run movies on their own home TV screens. Obviously it is impossible for any sponsor to pick up support and present



Would you pay $1 per program to see first quality movies on your home television set?

If the price were the same, would you prefer to pay for first quality movies via home TV or at a movie theater?

Fig. 7. Tele-Census Survey of May, 1954 in Los Angeles, Conducted By College Students and Their Instructors.

a first-run movie. Could you picture ten sponsors paying lets say 25,000 dollars each for announcements during a one and a half hour film presentation? It would probably require stretching the one-and-a-half hour movie into a two-and-a-half hour interrupted hodge-podge. The only answer for first-run movies in the home is subscription TV. Subscription TV should boom the motion picture business, produce a market which the Hollywood moguls never before realized, and develop a greater percentage of profit for the motion picture corporations.

The producer's dream is a fast pay-off of his invested capital in a motion picture production. Consider the wonderful tie-ins which will be made between magazine and newspaper advertising, as the picture is released. The first preview of the picture, if it is properly ballyhooed, may pay the full bill for the production costs; truly a panacea for an industry that has been sliding in both profit and attendance.

To quote Dr. Louis N. Ridenour, a Telemeter executive, "Telemeter can already bring you everything you expect in a first-run movie house, except hot popcorn; How to deliver it to you hot is still a problem, but we're working on it." Author's comment; That's a good idea Doc; however, if you put the popcorn maker in a decoder, make sure you can add salt.

Subscription TV Will Further the Arts

The Grand Opera, Broadway opening nights, and the Ballet will flourish when subscription TV comes into being. The opera lover,

the frustrated first nighter, and the ballet enthusiast will no longer be a minority audience, or a poor market with subscription TV. No longer will these cultural forms of entertainment be denied because of an economic problem. Those who wish to see the finer arts, will be able to fully support opera and ballet productions, which are not now telecast due to the current business analysis of what makes program material for mass viewing. As long as the sponsor knows that he will get a greater audience with a "thriller" or "tear jerker", he will not pay for the telecast of programs which are for small audiences. To again quote from Millard Faught:" In New York the ancient, decrepit Metropolitan Opera House can no longer make ends meet, even when it plays to SRO crowds, nor can it find advertisers who feel that they can afford to put the opera on TV; yet, if half the opera lovers in the United States had a chance to see a performance of Tristan and Isolde on box-office TV for just one night, at one dollar per head, they could burn down the old Met and build a new one.

"Similarly a single performance of South Pacific on subscription TV, at one dollar per family per set, with only 2 sets out of 5 tuned in, would return a box-office gate comparable to the entire 5 year run of this great show on Broadway at fancy box office prices. Of course, there would still be thousands of people who would continue to prefer their theatre in the theatre. However, I believe that such a modernization of its merchandising would breathe new life into the economics of the legitimate stage and would lower the present 6 to 1 odd against a play becoming a financial success."

With the tremendous potential return for the theatre groups from subscription TV, the demand for new productions would grow. There would be a terrific effect upon actors, writers, composers, producers, and all other artists who are devoted to the arts. How wonderful to know that the Phantom of The Opera will no longer be a creditor. Surely the famous opera deficit will fade into the past with the returns from subscription TV.

The philharmonic type of musical organization should prosper and make the field of music more desirable for America's younger set. Assuming only 2,000,000 homes pay a fee of 50 cents to see a concert conducted by one of the famous maestros, here is a million dollar return — far beyond the greatest dreams of any of America's present impressaries.

At first look it might be assumed that subscription TV could out-bid the sponsor for talent and for program time. Actually, since subscription TV will take only a small portion of each broadcasting day, it will not be a major competitor to the sponsored shows. In fact, considering the additional revenue available to the station from subscription TV, it is assumed that the sponsor will be able to have more viewers per dollar as a result of reduced station rates. Even if subscription TV had all the talent, and was able to present shows for many hours every night, it is doubtful that the average American family could afford to pay the bill for continuous paid entertainment. Therefore, subscription TV is relegated to operation for only limited periods of time.

The advertisers are of course seriously concerned with TV's very high cost. Indicative of this attitude is the statement of William Lewis, President of Kenyon & Eckhardt who stated that: "Subscription TV is one solution for advertisers at a time when video costs are getting too far out of hand." The February first, 1951 issue of "Advertising Age" reported "There are reasonably clear indications that advertisers cannot bear all the burdens of programming, especially if costs continue to increase as they have in the past, but there is a strong likelihood that the American TV system will wind up with a dual system — with advertisers bearing the brunt of the expense, but with subscribers paying fees for special attractions which no one can afford to handle on a strictly advertising basis." It is to be reasoned that the advertisers know the score, and that programs such as a half-million-dollar Ford Anniversary show is historic in nature, and that similar shows with comparable financial support will be few and far between.

An amazing and very practical scheme was evolved, by the Telemeter Corporation, which offered a new way for advertisers to use TV via the pay-as-you-see technique. Telemeter proposed a plan for selling the product at the point of sale. By proper point-of-sale advertising and associated promotion, the consumer would be sold on buying the product not only for its utilitarian purposes, but also to enjoy the TV entertainment offered by the advertiser over pay-as-you-see TV. Here is the plan in 5 steps as proposed by Telemeter for the mythical Fluf TV show:

Step 1. Point-of-sale advertising will feature Fluf's TV show, and also the fact that, if you buy a box of Fluf, you will receive a token which will entitle you to see this show free of charge.

Step 2. The Fluf package will feature a replica of the Fluf premium token — a free ticket to the show. The token itself will be the size and weight of a nickel, a dime, or a quarter as the case may be.

Step 3. The family who buys the product will be able to see the TV show without additional cost; all that will be necessary will be to drop the Fluf token in the Telemeter coin slot.

Step 4. The family who wants to see the show, but didn't buy the product, will have to pay the fee; otherwise, the show will be scrambled. (Every minute that the set is tuned to the scrambled channel, the barker, a feature of the Telemeter system, will be calling attention to the fact that the show is now on the air free for everyone who has the Fluf token.)

Step 5. All money and tokens put into the Telemeter coin box will be the property of Fluf. The cash can be applied against production and time charges.

The advertiser, therefore, can get the benefit of this tremendous new advertising gimmick without feeding his customers repetitious

blab. In fact, with the Telemeter plan, the advertiser funnels his newspaper, magazine, and point-of-sales promotion into TV pay-off. What an opportunity for the sponsor to be the producer of a show that might return a profit for the sacrifice of only a middle commercial.

As we have said before, sponsored shows and subscription shows are compatible, and even though they may be competitors in some instances, they will lead towards the benefit of all. Color TV will add to the rising cost of telecasting, which is now at the point where the advertiser can not extend his budget against the natural laws of good business practices, which call a halt at the point of diminishing returns. The acceptance of subscription TV and its benefits as described in this book will enable both the viewer and the sponsor to look forward to more coverage and better programs on many more stations than would be possible with the continuance of limited telecasting in accordance with the present economic problems.

SECTION II

SUBSCRIPTION TV SYSTEMS

To date four different systems have been developed to scramble and unscramble pictures. They are, in the order in which they make their appearance in this book, Phonevision, Subscriber-Vision, Telemeter, and Boxoffice. These systems have been demonstrated both privately and publicly in New York, Chicago, Los Angeles, and Palm Springs.

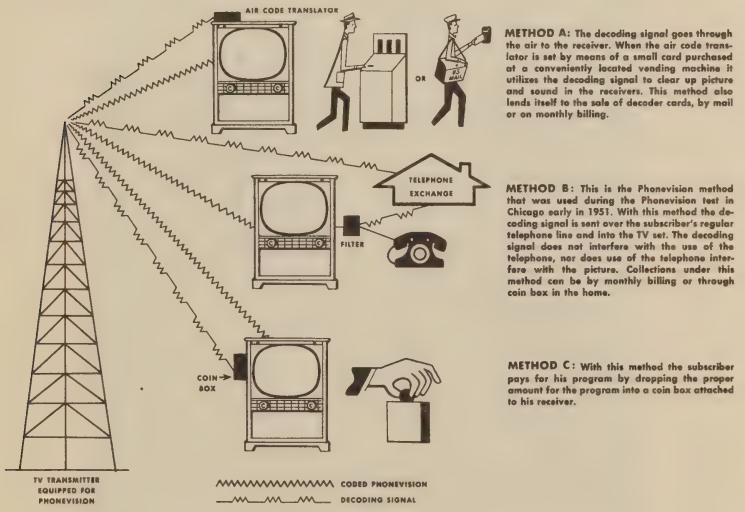

AIR CODE TRANSLATOR
OR
METHOD A: The decoding signal goes through the air to the receiver. When the air code translator is set by means of a small card purchased at a conveniently located vending machine it utilizes the decoding signal to clear up picture and sound in the receivers. This method also lends itself to the sale of decoder cards, by mail or on monthly billing.
TELEPHONE EXCHANGE
FILTER
METHOD B: This is the Phonevision method that was used during the Phonevision test in Chicago early in 1951. With this method the decoding signal is sent over the subscriber's regular telephone line and into the TV set. The decoding signal does not interfere with the use of the telephone, nor does use of the telephone interfere with the picture. Collections under this method can be by monthly billing or through coin box in the home.
COIN BOX
METHOD C: With this method the subscriber pays for his program by dropping the proper amount for the program into a coin box attached to his receiver.
TV TRANSMITTER EQUIPPED FOR PHONEVISION
CODED PHONEVISION
DECODING SIGNAL

Fig. 8. Three Methods of Zenith's Phonevision Telecast.

Phonevision

This system was developed by the Zenith Radio Corporation of 6001 Dickens Avenue, Chicago, Illinois. Fig. 8 shows the three Zenith Phonevision systems which have been designed for use in all homes within the service range of a TV transmitter whether or not these homes have telephones. Figs. 9A and B show the pictures as they appear to the viewer before and after decoding. The most well-known and fully-demonstrated system of the Zenith Radio Corporation is

Method B of Fig. 8, in which the key signal is simultaneously sent out by the station over local telephone lines. To receive the unscrambling signal, the subscriber calls a certain number and the operator (see Fig. 10) connects the key signal to his line. The transmission of the decoding signal does not interfere with the use

Fig. 9A. Phonevision Coded or Scrambled Picture.

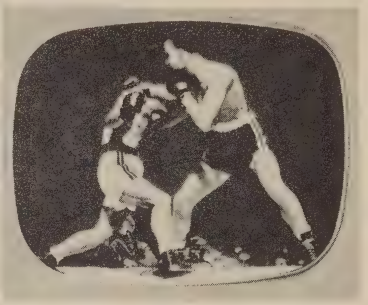


Fig. 9B. Phonevision Decoded or Clear Picture.

Fig. 10. Phonevision's Branch Exchange.

of the phone. The decoder unit, pictured in Fig. 11, is plugged into the socket connection of the Zenith television receiver as shown in Fig. 12. The plug (circled) is removed and the decoder box connector is inserted to provide contact with the circuits requiring additional signals to decode the scrambled Phonevision picture. To provide the

more technical reader with the specific details of the Phonevision Method B, we have prepared an edited version of the Phonevision technical introduction data prepared by Zenith in advance of their Chicago demonstration.

The reader should keep in mind when reading the following data on the Phonevision (method B) that it has been presented for historical purposes only to acquaint the reader with the original analysis of the first subscription TV system which was successfully demonstrated to the American public. The system to be described has been developed to a much improved form since 1951, and therefore it is only technically accurate as a historic system. Generally speaking, Zenith has given priority to a successfully demonstrated aircode system which will be described after the historical data presented below.

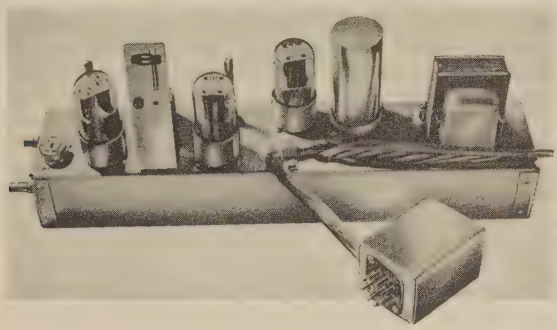


Fig. 11. Phonevision Set Decoder.

Fig. 12. The Zenith Receiver Showing the Socket Connection.

Phonevision is a method of applying secrecy to a television transmission so that the modified signal from a conventional transmitter can be received as a clear, intelligible picture only on a receiver supplied with a correcting signal over a secondary control link.

This secondary control link may be a twisted pair of wires, an electric power line, or an ordinary telephone line. The only requirement is that its use can be controlled at some point remote from the television receiver.

One method of incorporating secrecy or privacy in a television signal is to modify the original signal by producing a deliberate change in the relation of video, and the horizontal or vertical synchronizing signals. In this case, a key signal is sent to the television receiver via a second path to inform the set when this change is to occur so that a correction may be made for it. It is such a system which is here described.

In the system under discussion we shift, at times, the video information with respect to the horizontal synchronizing pulses. The shift introduced amounts to a small percent of the horizontal period. The picture is therefore transmitted in either of two modes; in one of these the video information appears normally phased with respect to the horizontal synchronizing pulses; while in the other, a phase shift is introduced between the video and the horizontal synchronizing pulses. The change from mode to mode is made at a random subfield rate. For example, for three or four fields the picture may be transmitted with a phase shift between video and synchronizing signals, followed by two fields with normal phase relation. The changing between modes is entirely at random and is determined by a noise source so as to give the system secrecy. The resulting scrambled picture with this type of transmission is one in which the image is moving back and forth horizontally at a slow irregular rate, producing an annoying blurred effect as shown by Fig. 9A.

The change between modes is accomplished during the vertical blanking period, thereby giving all circuits adequate time to stabilize. Accompanying one of the two modes of transmission is a key signal which consists merely of a tone of any frequency substantially higher than the field frequency. This key signal is sent via a secondary link to the Phonevision receiver. At the Phonevision receiver, the key information is used to cause circuits to compensate for the phase shift introduced between video and horizontal synchronizing pulses. Therefore, when the video being sent out is shifted with respect to the horizontal synchronizing pulses, the start of the horizontal sweep in the receiver is correspondingly changed. Absence of the key signal indicates normal phase between the video and the horizontal synchronizing pulses.

While a system, in which the shift between modes is determined instantaneously by the reception of the key signal, can be made to operate; it seems more desirable to send the key from the transmitter a considerable period before its use is demanded at the receiver. In this way, small variations in the delay time of the secondary control link can be neglected. An additional advantage is the reduction of the bandwidth needed to transmit the key signal in case the secondary control link is to be used simultaneously for other services, such as transmission of speech.

The system we are now using sends the key from the transmitter about 1/60th of a second or one field before it is actually used at the Phonevision receiver, as is shown in Fig. 13. If the

transition from one mode to another is to be made at the time t_0, the key is initiated almost one full field period preceding t_0. Circuits with adequate Q can be used in the key generating equipment at the transmitter so that the key signal does not build up to full amplitude until approximately three-quarters through the field period. In the

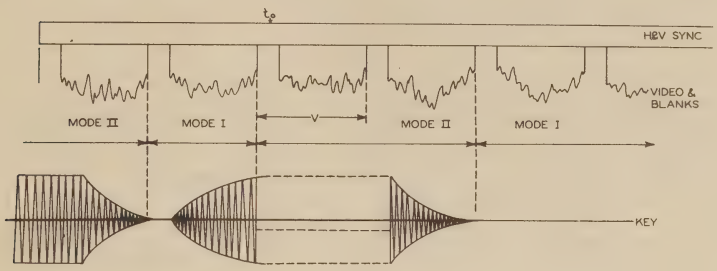


Fig. 13. Phase Relation of Key Signal to Transmitted Phonevision Signal.

receiver, a pulse derived from the vertical sweep circuit is combined with the key information so that the first vertical pulse present with the key, or the first vertical pulse in absence of the key, determines the transition between modes. Because of the length of time permitted for the key signal to build up to full amplitude, the bandwidth required to pass this signal is only about 120 cycles. The highest keying rate possible is 30 per second while the lowest is adjusted to be 10 or less.

It might be supposed that, because of the varying phase of the video signal with reference to the steady blanks, there will be introduced additional low-frequency components which normally would not be present in the video signal. How these low frequencies might be introduced can be better understood if we will for a moment consider a scanned picture consisting of subject matter which is white on the right and black on the left. In one mode, mixing of the video with the blanks will remove a portion of the video containing black information. In the other mode, a white portion of the signal will be removed. Consideration of Figs. 14A and B will immediately make it evident that this results in the introduction of low-frequency components. Transmission of such a signal would put an added burden on the studio amplifier, mixers, and transmitter in frequency response. Special precautions would also be required to assure adequate low-frequency response in the receiver. The insertion of a jittering horizontal blank in combination with the fixed blank, Figs. 14C and D, prevents the generation of these low frequencies, since video information of both modes is now identical. To maintain secrecy, the jittered blank is set at a gray level.

Those portions of the shading generator which are associated with horizontal shading are initiated by the same horizontal

synchronizing pulses which actuate the horizontal sweep in the pick-up tube. In the case of Phonevision, the coded horizontal synchronizing pulse which causes the time displacement in the video is also fed into the shading generator so that the horizontal-shading signal will be shifted in phase with the video. In this way, any flicker which would be introduced because of video shifting with respect to the horizontal-shading signal is eliminated.

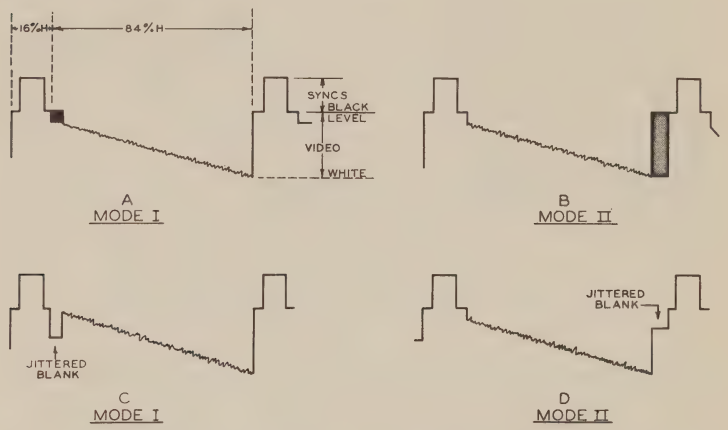


Fig. 14. Preventing Generation of Low-Frequency Components by the Addition of a Jittered Blank.

Transmitter

Let us consider now in more detail the circuits required to convert an ordinary TV transmitter to one capable of transmitting Phonevision pictures. As shown in the block diagram, Fig. 15, a typical transmitter will consist of a normal crystal-oscillator stage, followed by RF amplifiers, multipliers, and modulator. The studio equipment consists of some type of pickup tube, an iconoscope or equivalent. The heart of the studio gear is the synchronizing signal generator in which the synchronizing pulses, both horizontal and vertical, and blanking pulses, are generated. Vertical-synchronizing pulses are supplied to the vertical-sweep circuits directly, with no change in this portion of the circuit. However, the horizontal-synchronizing pulses, instead of being fed directly into horizontal-sweep-forming circuits, now pass through a new unit which forms jittered synchronizing pulses. We will call this the Phonevision coder. The output of the iconoscope is fed into a head amplifier in which mixing of video signals, plus the shading signal, is accomplished. The output of the head amplifier is fed into the jittered-blank unit after which the signal passes to the mixer where steady blanks are added. At this point, control is also maintained over contrast and background setting. Synchronizing and blanking generators also supply the composite synchronizing signal to the video amplifier

where the video signal from the iconoscope, plus the blanks, are mixed with the composite synchronizing waveform. The entire composite video signal is then fed to the modulator. Also generated by the Phonevision coder is the key signal which is applied to the secondary control link and distributed to Phonevision subscribers.

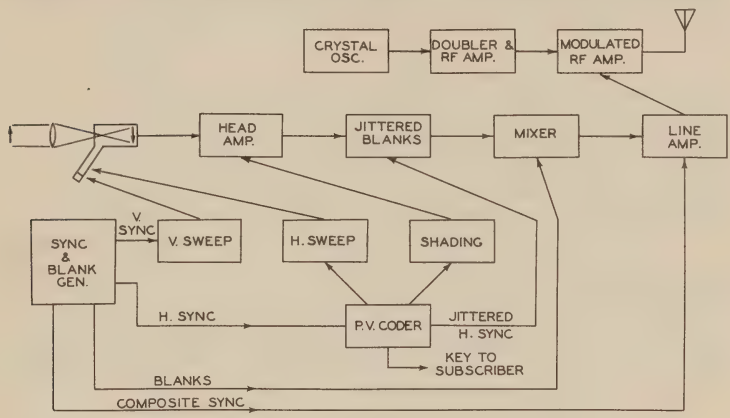


Fig. 15. Block Diagram of a Typical Phonevision Transmission.

Fig. 16 is a block diagram of a typical coder unit for the system described above. This unit can conveniently be broken down into four primary sections as indicated by the dotted lines. In the first section is the random key generator, the heart of the Phonevision system as far as secrecy is concerned. Input to this portion of the unit consists of a normal vertical drive pulse which is fed through an isolation stage and phase control to a blocking oscillator circuit. Combined with the vertical pulse is the output of a noise generator. Combination of these two signals results in a pulse from the blocking oscillator occurring randomly but only at the time of the vertical synchronizing signal. By adjusting the noise signal by means of the limiter, the blocking oscillator can be made to operate between 60 and 20 times per second. Alternate signals from the blocking oscillator produce square wave control signals by means of a multivibrator. The square wave in turn keys on an oscillator operating at the key-signal carrier frequency. The output from this oscillator is shaped in an amplifying stage to have a rise time of approximately two-thirds of a field period and is then distributed through the secondary control link.

The output of the key oscillator is also fed to the second section of the coder which generates the coded horizontal drive used by the cameras, monitors, and shading generators. The oscillator signal is combined with the vertical pulse in a gating circuit which in turn determines the points of transition of a single-trip multivibrator. The vertical pulses out of the gate circuit are positive when the key

signal is applied and negative in absence of the key. Application of the positive and negative pulses to one of the control grids of the single-trip multivibrator causes changes in the modes of operation at the time of the first vertical pulse present with the key and the first vertical pulse after the key has been turned off. A normal horizontal drive pulse is fed into the coded horizontal-drive generator

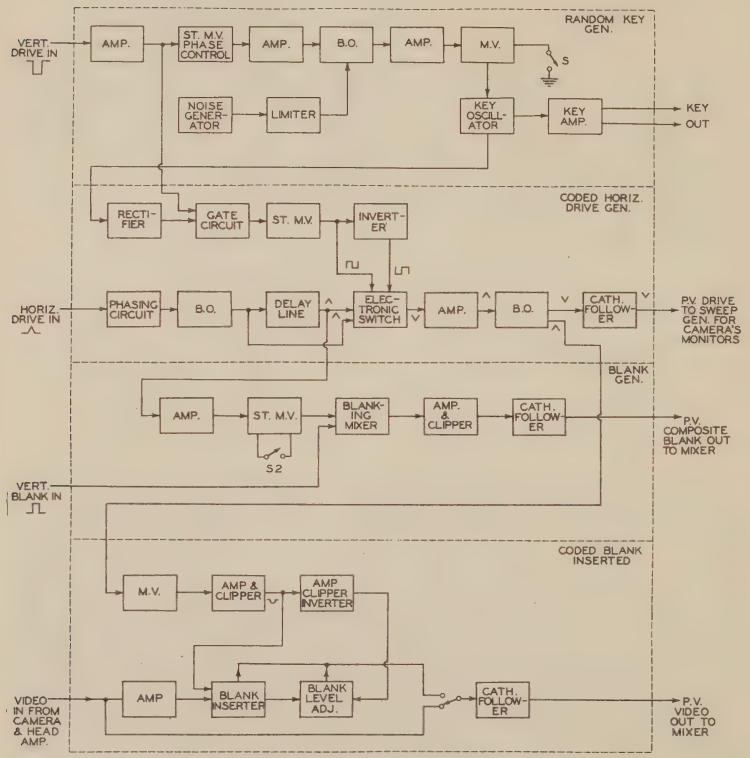


Fig. 16. Block Diagram of Phonevision Coder.

through a phasing circuit which produces a pulse shifted in phase with respect to the normal horizontal-synchronizing pulse. A blocking oscillator triggered by the shifted pulse drives a long line having a delay equal to the time change desired in the video. An electronic switch chooses either the pulse from the input or the pulse from the output of the delay line as directed by the single-trip multivibrator, and, in this way, produces the coded horizontal drive.

As indicated earlier, the horizontal shift in the video is obtained by using some of the time normally required for the horizontal blanking

pulse. This calls for a revised horizontal-blanking signal of less width. The new blanks are generated in the third unit of the coder by feeding horizontal pulses from the output of the delay line through an isolation amplifier to a single-trip multivibrator. Normal vertical-blanking signals and the output of the single-trip multivibrator which forms the horizontal blanking are mixed in the blanking mixer and then amplified and clipped and made ready for distribution through a cathode follower.

An additional requirement, that of coded blanking insertion, is taken care of in the fourth section of the adapter. The output of the coded horizontal-drive generator triggers a single-trip multivibrator by means of which coded blanks are obtained. Both polarities of the blanking waveform are combined in two tubes having a common load impedance. Video from the camera chain is applied to the blank inserter and mixed with the coded blanking.

The second section of the blanking inserter adjusts the blanking level, maintaining this level approximately at the average video point. After insertion of the coded blanking, the signal is distributed to the usual mixers through a cathode follower.

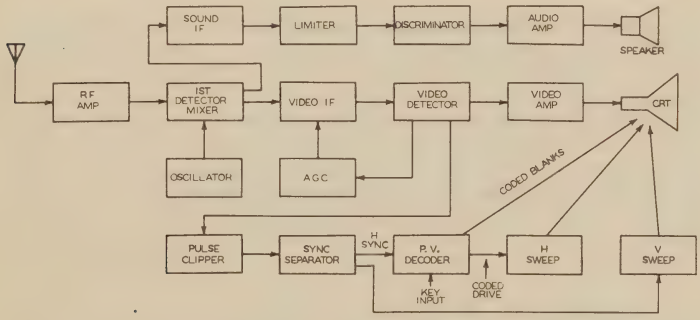


Fig. 17. Block Diagram of Typical Phonevision Receiver.

Receiver

The design of a television receiver is changed only slightly by the addition of Phonevision. A Phonevision receiver shown in the block diagram of Fig. 17 consists of the normal RF amplifier, first detector, mixer, and local oscillator, followed by the video IF, the video detector, video amplifier, and picture tube. The video detector is followed by the synchronizing pulse separating circuit. The vertical pulse is separated in normal fashion and actuates the vertical sweep of the picture tube. The separated horizontal synchronizing pulse, on the other hand, is fed into a Phonevision decoder unit. This unit, actuated by the key signal coming over the secondary link to the Phonevision receiver, applies a correction to the horizontal synchronizing pulse which triggers the horizontal sweep circuit.

A block diagram of a typical decoder unit is shown in Fig. 18. Since the level of the key signal from the control link is approximately 50 millivolts, the decoder is preceded by a stage of gain. A gating circuit combines the key information with the vertical pulses obtained from the television receiver to trigger a square wave generator.

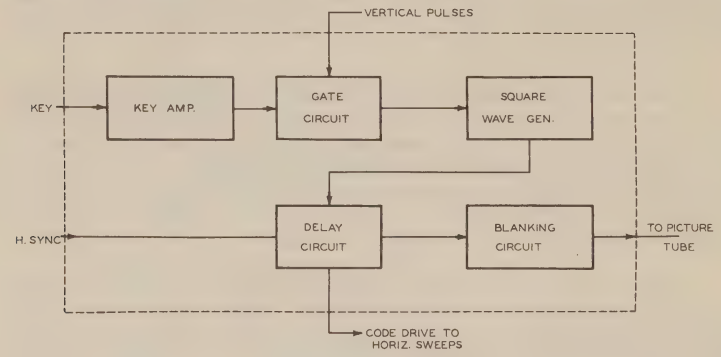


Fig. 18. Block Diagram of Phonevision Decoder.

The gating circuit and square wave generator have the unique property of being able to detect the first vertical pulse in presence of key and the first vertical pulse in absence of key. Thus the square wave generator will change modes of operation as dictated by the key information and will at the same time be synchronized with the transmitted vertical synchronizing signals. The resulting square wave controls the phase of the pulses obtained from the normal horizontal-synchronizing circuits of the receiver and thereby controls the drive to the horizontal sweep of the picture tube. The proper amount of phase shift controlled by the key corrects for the phase shift originally inserted in the transmitter by the Phonevision coder.

A blanking circuit is also provided which is controlled by the coded horizontal pulses and restores the blanking interval to normal width.

Distribution Of Key Signals

The method of distribution of the key or decoding signal in this Phonevision system is to superimpose it upon the regular telephone line of a customer. At the present time, many such additional signals are superimposed on intercity telephone toll lines, the well-known "carrier" channels. It is also done in certain instances on lines to subscribers. Since the key signal we require needs only about 120 cycles of spectrum space, it can be added immediately above the normal voice band. The attenuation at this frequency in the usual telephone subscriber plant is well within the limits required to permit sensing the decoding signal at the customer's home. Frequency separation networks of simple type have been produced to do this with low insertion loss. Thus we find one possible means of extending our decoding signal to the user.

It would, of course, be possible to conceive of such service furnished on a flat rate basis; that is, the customer pays a fixed monthly fee without regard to his use or failure to use the programs offered. However, the number and type or programs that may be offered to the subscribing public is great. It is also clear that not all segments of the viewing public will desire to support the same type of programs; one group may prefer original first run motion pictures prepared for television subscription viewing; another may prefer live plays; another may prefer sports events which might require reimbursement of the sports management, etc. Because of such varying selections, the economics of a possible "season ticket" to a subscription service is not as promising as that of a procedure preserving the right of election by the customer.

If we seek such a solution we now have three principal problems:

1. The customer must be able to report his desire to obtain the decoding information for the particular program of his choice.

2. The correct decoding signal must be returned to him during the program or programs which he selects, and not otherwise.

3. There must be made a record of the transaction for billing purposes.

Clearly, if we are thinking of using telephone lines to distribute our key signal, it is most convenient to use the telephone central office as a means of solving problem 1. We will focus our discussion on customers living in areas served by dial offices since manual telephone service is a dwindling facility. It is also true that the largest segment of the potential audience for subscription service will be found in the metropolitan areas served by panel, crossbar, or step-by-step dial offices.

At first thought, one might suppose that the Phonevision terminal which will record orders and attend to distributing the appropriate key signals could be assigned a telephone number like any other business, with perhaps a large number of lines as is done for frequently called businesses like the Western Union Telegraph Co., or large department stores. As will be seen in our consideration of traffic loads below, this might lead to overloads in the terminating end of a central office. If the lines to the Phonevision terminal are taken from the outgoing trunks of the originating central office equipment as is done for calls to "Information", or "Long Distance", etc., we further gain several valuable advantages in means of transmitting identifying signals. Once a subscriber is connected to a Phonevision terminal he can make known his identity and wishes verbally. Indeed, in small-scale trials just this will be done. For a large volume of calls, such procedure wastes valuable circuit time. Many mechanical methods can be planned. One would be the transmission of audio frequency pulses. A method that is much simpler and which requires no unusual equipment, for the purpose at the customer's premises is to use DC pulses from his telephone dial.

This will permit registration of his desires if the connection is set up as is shown in Fig. 19. In this we see that a Phonevision subscriber obtains access to the Phonevision terminal by dialing a three digit code. The cross bar equipment interprets this correctly and routes the call to a given group of trunks on the office link frame assigned, and cuts the subscriber directly through to the special Phonevision equipment without interposing a repeating coil. Thus direct current interruptions by his subsequent dialing will be received by suitable relays in this equipment. At this point the subscriber will receive some signal to inform him he has reached the Phonevision terminal.

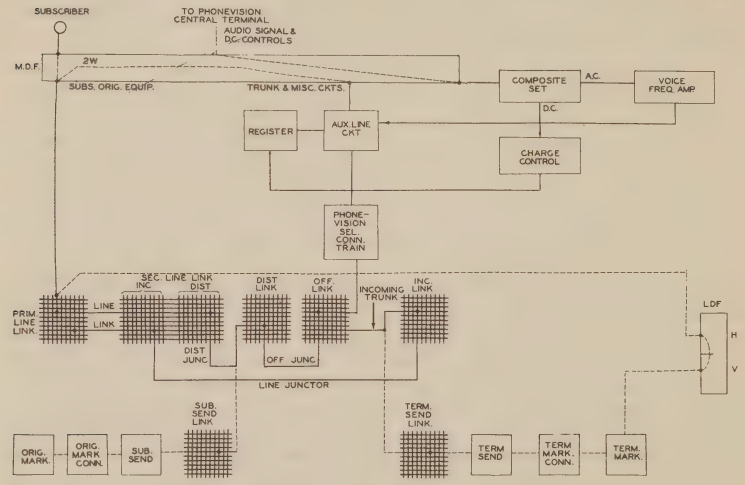


Fig. 19. Telephone Central Office Equipment — Crossbar System Adapted to Phonevision Distribution.

This may be a second dial tone, as is commonly done in outgoing trunks from private branch exchanges. On receipt of this signal he dials about seven additional digits to perform the following functions: the first four digits (or five if more than 10,000 customers in a given office are signed up) will identify him; these may be an arbitrary number, his "contract number". During receipt of these digits, the Phonevision terminal makes selection of the auxiliary line circuit cross-wired to the particular subscriber corresponding to this contract number. It can now make positive identification, in a simple loop test, that the customer has indeed dialed the correct number to identify himself and has reached his own auxiliary line equipment, thus avoiding the mistaken ordering up of signals for another party. The auxiliary equipment is now made ready to respond to the order of the customer for the selection of the program he desires to receive. The auxiliary equipment can be easily designed to permit a subscriber to indicate a choice for any one of several programs, e. g., Program A at 7:00 - 9:00 PM; or Program E at 9:00 - 10:30 PM.

One may provide for several time intervals and program choices to be designated by a one or two digit decimal code.

This auxiliary line equipment can be made up in many ways. One easy solution is to use a stepping switch with one relay and a printing tape. This solves problem 3, recording the transaction. With the completion of dialing, the customer may receive a recorded announcement of the program code he has just ordered up if this seems desirable. This announcement, if provided, may be followed by timed release if the subscriber does not hang up first. Either the timed release or the customer's hanging up clears all equipment in the originating crossbar path, but leaves the auxiliary line equipment attached to the customer's line to transmit to his set the decoding signal when the time for it is at hand. The auxiliary line equipment is arranged so that it does not make the line test "busy" to incoming, nor prevent outgoing calls. The signal may be attached to the subscriber's line through a frequency separating network if this is considered desirable. An attenuating pad eliminates cross-talk from one line to another when both are attached to a common key signal source.

The equipment can be restored to normal after the program by a common release signal initiated by the Phonevision terminal at the conclusion of the transmission interval; or, a subscriber can free his line from any code previously selected by dialing, before or during a program, the same digits already described; and finally, dialing some arbitrary release signal, possibly zero.

Access to the Phonevision terminal to register program choice may constitute a large traffic load for the telephone central office equipment. To see how serious this may be, let us assume a typical office of the latest type and examine the magnitude of this load for a heavy development of such subscription service, a development that is several steps removed from any initial installation. We will select a telephone office serving approximately 34,000 working terminals of mixed business and residential service in a community adjacent to a large metropolitan area. We will assume that crossbar equipment is provided to serve this group of subscribers. We will further assume that one-third of this office's working terminals are equipped for subscription television service, roughly 11,330; and that, at any one time, about 60 percent of these might wish to receive programs coming at the same hour. These are rather liberal allowances and present the worst load condition which might mean that 6800 calls would be attempted to the Phonevision terminal in one hour.

To assess such telephone loads, we must measure them in terms of circuit use. The common unit is the "call-second"; that is, the load may be expressed as the product of the number of calls multiplied by the average number of seconds utilized in the connection. This is "calling rate" times "holding time." All telephone trunks and central office equipment quantities are engineered by the application of mathematical theory of probability to accurate forecasts of average loads. What average holding time should we assume for

our case? Nine or ten digits are to be dialed. This can easily be done in 15 to 20 seconds. We will assume an average holding time of 40 seconds. We may compare this to the average holding time in a crossbar office of approximately 15 seconds for a subscriber sender which receives seven or eight digits. Since this 15 seconds includes allowance for calls to call-indicator offices with longer holding time, we may conclude that our allowance is reasonable. Indeed the ordinary crossbar sender will assume that trouble exists if the subscriber exceeds 40 to 60 seconds in dialing.

With the assumed 40 seconds average holding time, the load in this case is 40 x 6,800 = 272,000 call-seconds. If this load were uniformly distributed throughout an hour, or distributed with the usual telephone traffic random fluctuations, we would require, as we may determine by consulting probability tables, about 105 trunks to the television terminal if one call in 1,000 is to encounter a busy condition. If we assume that the customers are not forehanded and that they bunch 70 percent of the calls in the last 30 minutes, our load rate would increase and we would now require 147 trunks for the same busy-trunk probability. If we wish to assume still further compression of this load, we will find that the number of trunks increases. The number of these trunks can be made equal to the requirements of the most probable load concentration. The relay equipment required for these trunks is part of the subscription equipment and is, in effect, leased or paid for by the customer. We will not attempt to go into the costs involved, let it suffice to say that the investment in such trunks, per customer, is not seriously high. Indeed it becomes smaller per customer as the density of the service increases.

In the past, telephone central offices have been subjected to severe bunching of calls in radio call-in programs which promised rewards or premiums, or which merely sought the votes of the listeners. The loads in these cases were very severe since they were synchronized and triggered by an announcer's request for votes, or the release of a final clue. In addition, the traffic loading was aggravated by the tendency for wily subscribers to anticipate such announcements by initiating a call ahead of time and waiting to dial the final digits until the key words were received over the radio, thus insuring access ahead of the pack. This frequently caused equipment to time-out and release partial connections, wasting traffic capacity.

Since any installation of such a subscription service must begin with small numbers of customers, the initial load increment upon the telephone facilities will be trivial. If the number of trunks to the television terminal are accurately adjusted to the load, customers will become accustomed to setting up their program choices fifteen minutes to an hour in advance of the show (indeed more foresight is usually required to see a movie or stage show). This concludes the edited portion of the Phonevision technical introduction data prepared by Zenith.

Again the reader is reminded that the method B system was described for background purposes only, and that Zenith has assigned method B only a minor role in their future subscription TV plans.

Zenith has a large engineering staff who have been devoted exclusively to furthering the subscription TV art. See Fig. 20. To date (Sept. 1954) Zenith has been granted more than thirty patents, and has over fifty patent applications in the subscription TV field. As previously stated, Zenith has given priority to developing the methods shown in Fig. 8A and C, which is said to contain many original inventions.

In methods A and C of Fig. 8, the key signals are transmitted over the air rather than by phone. The subscriber purchases a card which, when inserted into the decoder, utilizes the key signal to decode the picture. The other method employs a coin-operated electronic mechanism to decode the program. In this method the subscriber drops the proper amount in coins into a box attached to his receiver.

To present the technical reader with accurate details of systems which Zenith is actively developing, we are presenting an analysis prepared by two of Zenith's outstanding Phonevision executives, Mr. P. E. Van Beek and Dr. Alexander Ellett.

"Following the development of the Phonevision system used during the Chicago tests of 1951, Zenith unveiled another system of subscription television, also called Phonevision, which differs materially from the original method. This new system is an aircode system, a term which points to the fact that no telephone lines are used and decoding information is transmitted over the air. Zenith prefers this system for various reasons, prominent among which is the fact that it requires a smaller amount invested in equipment per subscriber. Another significant advantage is that it has a much greater operational flexibility.

"In this aircode system, picture and sound are scrambled by sending them in one of 32 discreet conditions or modes. A change in mode is made at random at intervals an integral number of fields in length.

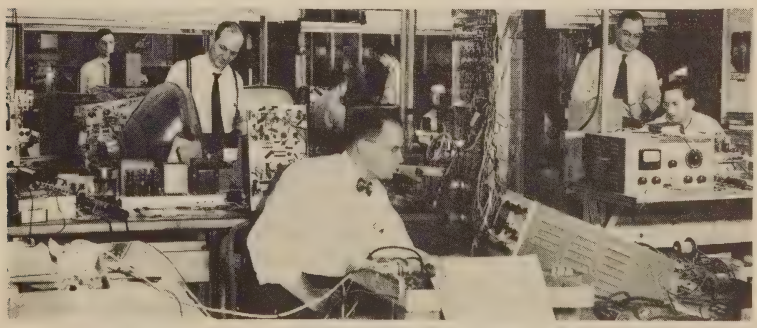


Fig. 20. Zenith Phonevision Engineering Laboratory.

"In order to decode picture and sound, it is necessary to send information to the receiver informing the decoding mechanism as to which of the 32 possible mode conditions is the proper one to use during the succeeding field period. This information is sent from the transmitter to the receiver in the form of a series of pulses having distinctive characteristics thus making it possible to separate and route them at will.

"The pulses forming the aircode are unusable directly, but must be operated upon by a mechanism which switches them into a mode-determining circuit having a large number of active inputs. The separated aircode pulses can be applied in a great number of ways to the mode-determining circuits. However, only one combination will effect decoding.

"The mechanism which actuates the switch to the mode determining circuit is unique for each subscriber. This makes it necessary for every individual subscriber to obtain a key number for each program he wants to view. This key number is usable in one decoder only thereby making the system analogous to a number of combination locks requiring different combinations to achieve the same result. The device is so designed that the portion of the mechanism which corresponds to the tumblers of a combination lock can easily be altered thereby further insuring security.

"Each subscriber is given an identification number. Special computing equipment has been developed which associates this number with the program key number a subscriber is to receive. This computer presents its information in a variety of ways making the system flexible with respect to the method of distribution of key number information.

"More specifically, the computer allows an operator to give key information verbally by telephone to a subscriber calling the local Phonevision center for this information. In a second method, the computer can print information for a number of programs scheduled for broadcasting during a certain period of time, on a card. The key information is carried on the card in such a manner that it cannot be extracted without making certain changes in the outward appearance of the card. Thus, the card registers use and permits easy computation of charges. In this particular case, payments can be made either by returning the card to the local Phonevision office which will then bill the subscriber, or by taking the card to a local bank, or any other place where a cash payment can conveniently be made.

"Aside from these two systems of distributing key information, the computer can also be connected with vending machines placed in drug stores, shops, filling stations, etc. The subscriber dials his own identification number on the vending machine and after indicating a program choice, the vending machine issues a small card containing the key number applicable to the broadcast selected. As the vending machines are connected by private wire with the computer, the proper key number for a subscriber can automatically be determined and flashed back to the vending machine which in turn prints and issues the card. Although the vending machine is seen primarily as a cash-and-carry device, charge account customers can also be accommodated as the computer keeps complete registration of each purchase.

"In cases where it would be desirable to place a coin box in the home of the subscriber, the equipment developed in connection with the aircode system permits a coin box to be attached to the receiver. Only after insertion of the proper amount will the decoder unscramble the jittered picture and sound.

"Inasmuch as all key distribution methods of the aircode system can be operated simultaneously, it is clear that this particular method of subscription television has a high degree of commercial flexibility.

"The administration of subscriptions also requires various equipment, most of which, however, resembles tabulating and billing machinery presently on the market."

To further prove the practicality of the system described above, Zenith in June, 1954, completed a successful number of tests in conjunction with WOR-TV. In the New York tests, no telephone circuits were used. Both the television picture and the special codes were carried by the WOR-TV transmission. These tests of the Zenith airborne-coding methods were made to confirm the tests that Zenith made in its laboratory on low power transmitters. To quote Mr. Charles Singer, chief engineer of WOR-TV, who observed the Zenith on-the-air-tests: "The equipment that Zenith installed at the WOR TV transmitter was excellently engineered and could immediately be used commercially. The installation operation of this equipment proved both effective and simple. It has been designed in such a way that the possibility of interference with the regular television broadcast is entirely eliminated. Although the system provides highly complex coding, I was impressed with the overall simplicity of the equipment." While the FCC has not approved commercial operation of Phonevision, it is obvious that Phonevision is ready for commercial operation should approval be granted.

Subscriber-Vision

This is a development of the Skiatron Electronics and Television Corporation of 30 East Tenth Street, New York City. Skiatron Corporation is a growth from the old Scophony Corporation, which at one time was one of England's leading TV development groups. The initial Skiatron patent, number 2,251,525, was filed in April 1940 under the heading of "Secret Television System." This was the initial system which was converted into practice and demonstrated over the air in November and December of 1950 at which time WOR-TV offered the use of its facilities to the Skiatron Electronics and Television Corporation in the interests of furthering the television art. The initial system proposed by Skiatron employed a coder unit at the camera and transmitter and a decoder unit at the receiver. The standard TV synchronizing pulses at the transmitter were fed into a small kinescope tube and projected on to a photo-electric cell, the output of which was used to supply the final synchronizing pulse. A card with holes in it, or with any other configuration or picture upon it, was placed between the kinescope tube and the photo-electric cell.

The light and dark spaces on the card served to displace the horizontal synchronizing pulses so that they did not occur at the same time as the uncoded normal pulse. Every fourth vertical synchronizing pulse was stretched in order to put the coder in step. There were four distinct displaced images observed on a standard TV receiver which was not equipped with the necessary decoder unit. The decoder unit was connected to the receiver and was similar to the coder. A card identical with that used in the transmitter was employed in conjunction with the receiver decoder. It has the effect of displacing the scrambled synchronizing pulses in the opposite direction so that the pictures were in step and a single picture was then viewed at the receiver. Figs. 21A and B, shows us the coded and decoded pictures of the modern Skiatron Subscriber-Vision system.

The author presents an edited version of a paper prepared by Skiatron's engineering chief, Mr. William Shanahan.

Fig. 21 (C) shows a caricature type of television picture as it was transmitted over a link from a camera to a receiver. The picture is perfectly normal and clear as the synchronization required to hold each element of the picture on the screen is "locked" or synchronized. If you look very carefully at Fig. 21A or any television picture you will find that it is made up of lines. These lines pass in a horizontal direction from left to right, and produce a series of dots in a horizontal direction as they make up the television picture. Actually, although it appears that the entire picture is transmitted at one time, it is made up of a series of lines transmitted sequentially, one after the other. In order to get accurate registration from line to line, and subsequently from complete picture or frame to complete picture, we must have synchronization pulses. These synchronization pulses lock the edges of each of these lines in a certain place on the left-hand side of the television receiver screen, and make the picture appear to stand still. Thus, in a sense, the television picture is caused to retain a continuity from top to bottom and from picture to picture.

Fig. 21 (D) shows what happens when Skiatron purposely distorts the relationship between the television synchronizing pulses and the video information.

In this picture we have exactly the same picture as Fig. 21 (C), except that now the synchronizing pulses are no longer steady, but are caused to rock backwards and forwards with respect to their normal position; naturally the television picture generated by the receiver performs the same rocking motion. The result is a jittery picture. (Skiatron in practice may also turn the picture negative), see Fig. 21 (B). As you can see here, even in a still picture the details have become so blurred as to become unrecognizable and of course, if the subject were in motion, the picture would be even more blurred than shown.

To analyze this scrambled system we must first investigate the details of what happens in the camera. At this point we have stretched

out the horizontal synchronizing or drive pulses in the camera, see Fig. 22, so that individual lines are shown one after the other instead of one on top of the other. Underneath this figure is shown the saw-tooth waveform which is used to drive the electron beam in the camera repetitively, from side to side. It will be noticed in a general way that these sweeps still correspond to the horizontal drive pulses, but

Fig. 21A. Before Coding.

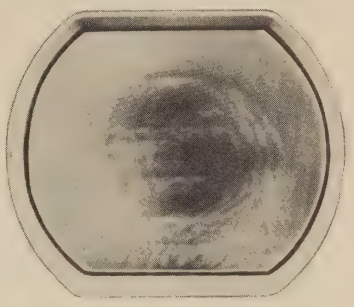


Fig. 21B. After Coding.

Fig. 21C. Steady Picture

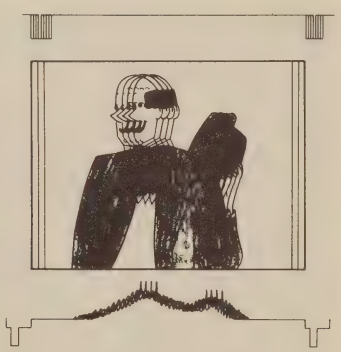


Fig. 21D. Scrambled Picture

it is quite evident that they are continuously being shifted back and forth. On one type of Subscriber-Vision operation only three or four specific positions are chosen in order to simplify the operation of the coding and decoding equipment.

Fig. 23 shows the actual Skiatron equipment used to scramble the audio and video signals. Fig. 24 diagrams the entire transmitter arrangement. A television synchronizing generator is provided in all studios to produce 60 cycle pulses to drive the sweep from the top to the bottom of the picture, and 15,750 cycle pulses to drive the sweep from left to right. If you take the ratio of these two, you will find that it comes out as 525:2, which means we get 525 lines during every

two vertical pictures, which make up one frame. The vertical pulses are employed in the coding equipment which is shown by the dotted line, to produce a series of switching signals. These switching signals are used to transfer from one position of the horizontal sweep described before, to the second, to the third, to the second, to the third, and so forth. Horizontal signals are, of course, fed into the horizontal sweep generators.

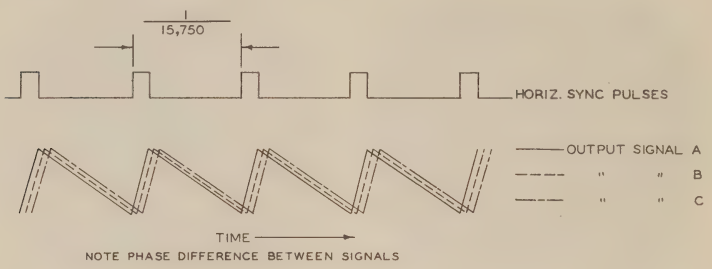


Fig. 22. Horizontal Synchronizing Pulse and Saw-Tooth Waveform Relationship in Skiatron System.

Fig. 23. Skiatron Executives Operating Equipment Used to Scramble the Pictures at the Station.

In the Subscriber-Vision system, the vertical sweep is not normally altered by the coding signal. As you will notice in Fig. 24, the 15,750 cycle horizontal pulses are used to generate not one, but three sweeps which are shown on lines A, B, and C from the sweep generator. The vertical pulses are used to drive a field selector which feeds into a "field switching and selecting circuit." This means that on some field, sweep #1 (which is shown on lead A) is selected.

On other fields, sweep #2 (which is shown on lead B) or sweep #3 (which is shown on lead C) are selected. Obviously, one of these sweeps must be selected at all times; otherwise there would be no picture.

The selected sweep output is fed to the television camera producing the jittery images discussed before. Vertical sweep is derived

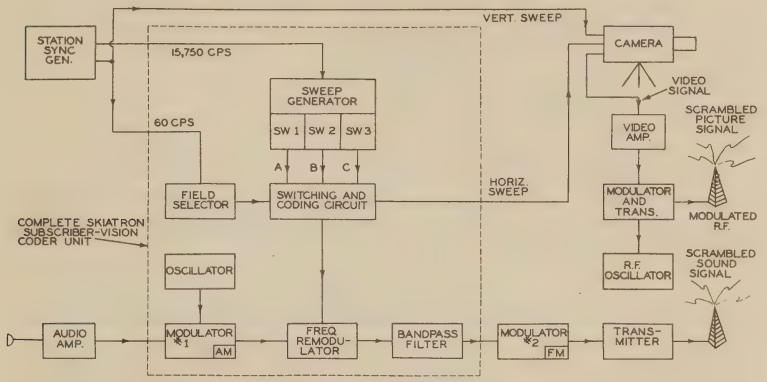


Fig. 24. Diagram of the Skiatron Transmitting Station Arrangement.

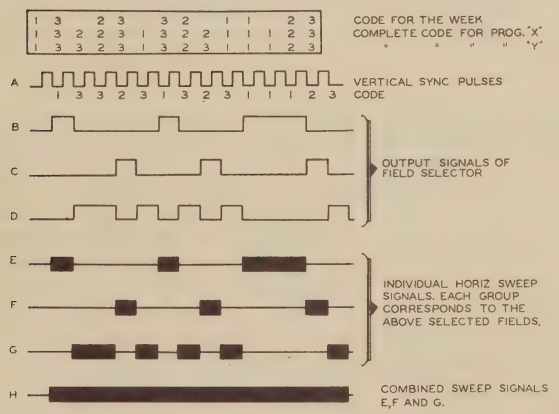


Fig. 25. Action of the Horizontal Pulses, Sweeps, and Vertical Pulses in Subscriber-Vision System.

directly from the 60 cycle synchronizing pulses. At the same time, the audio portion of the television signal is scrambled by a double modulator arrangement. This double modulator takes signals from the switching and coding circuit and combines them with an oscillator and an amplified audio signal to produce a complex, scrambled signal

which is varying back and forth in frequency as the television picture is varying back and forth in time.

In order to see the switching more graphically, we must study Fig. 25. This diagram shows the time sequence of the switching and coding operation. Suppose we draw a line A and represent the vertical synchronizing pulses along it by the vertical excursions. Now in between each vertical pulse let us write a number from one to three. You will notice that the diagram says 1, 3, 3, 2, 3, 1, 3, 2, 3, etc. Now, on lines B, C, and D are shown the corresponding output signals of the field selector in the previous diagram. Notice that the first line, (B), corresponds to the selection of sweep #1, the second line, (C), to sweep #2, and the third, (D), to sweep #3. We can compare the three waveforms since they have been prepared to fall in with the sweep arrangement discussed previously. One of the three positive signals is present at all times. Thus, during the first field B is positive, during the second and third fields D is positive, during the fourth field C is positive, and so on.

To continue the analysis, we must examine the selected waveform. In lines E, F, and G are shown the sawtooth signals which are going to the camera. When B is positive it selects the first set of the sweeps, when C is positive it selects the second set of the sweeps, and when D is positive it selects the third set of the sweeps. These are shown as solid black because of the time scale, but actually in each of the black areas is present 262.5 individual and self-contained sweeps. Finally, in line H, all of the sweep signals are combined producing a single, resultant sweep which is present at all times.

With the coding apparatus out of the way, we can take a quick look at the means whereby we can reproduce the same coding pattern (as used at the transmitter) at the receiving end. This is done by means of the air signal alone. Because of the fact that we have set up a specific type of code at the transmitter, we can certainly set up the same type of code at the receiving end by altering the "field selector" in the receiver, and end up with a complete reconstitution of the original picture. Fig. 26 pictures the complete system in operation. Let us suppose we are interested in transmitting the program from the theatre, where it originates, into the home by means of this subscription television service.

A television camera, equipped with the Subscriber-Vision coder just described, is set up right in the theatre. Possibly several cameras are employed in order to give all possible desirable angles. A scrambled signal is then generated which is sent to the television transmitter over a video cable, where it is transmitted as a scrambled signal. In the Subscriber-Vision system, therefore, the sound and picture are transmitted over the same airways as would normally be employed for ordinary television transmission. There is no piped video signal or piped sound system employed.

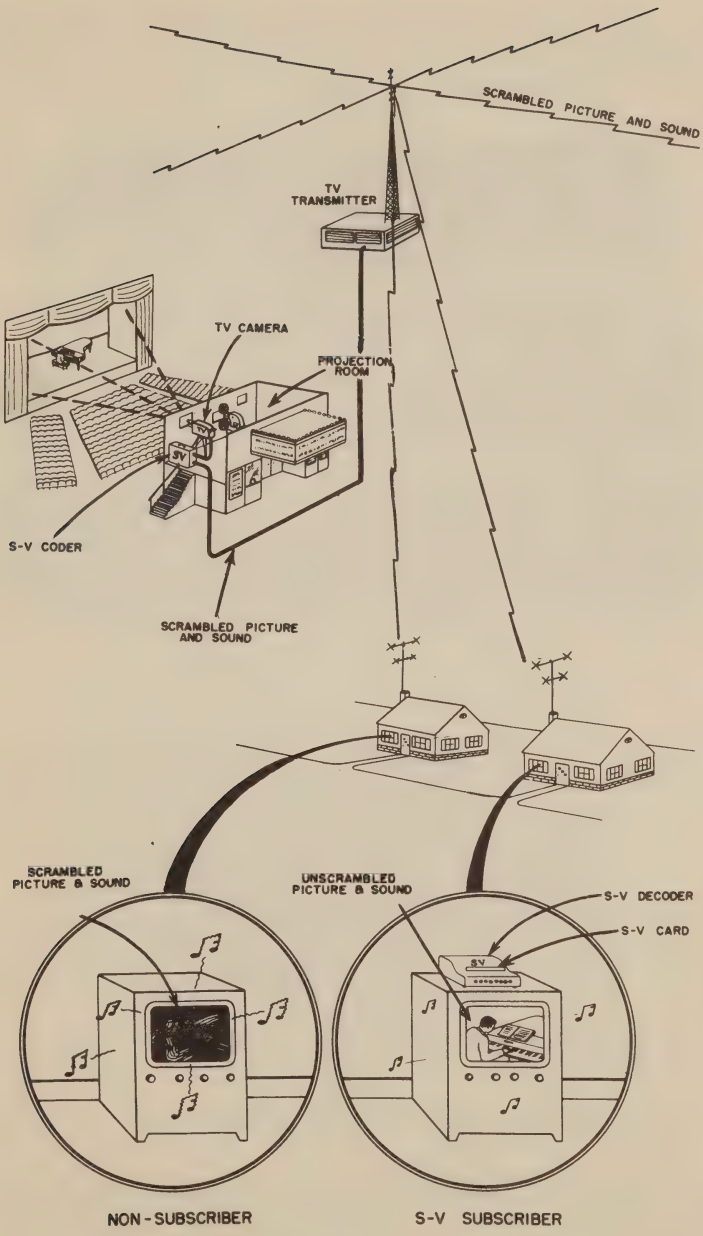


Fig. 26 Operation of Skiatron Subscriber-Vision (S-V) System.

Now let us look in on the homes of a typical subscriber and non-subscriber (see Fig. 26). The television set in the home on the left produces a picture which is exactly as it was sent out from the transmitter, with a jumbled picture and simultaneously jumbled sound.

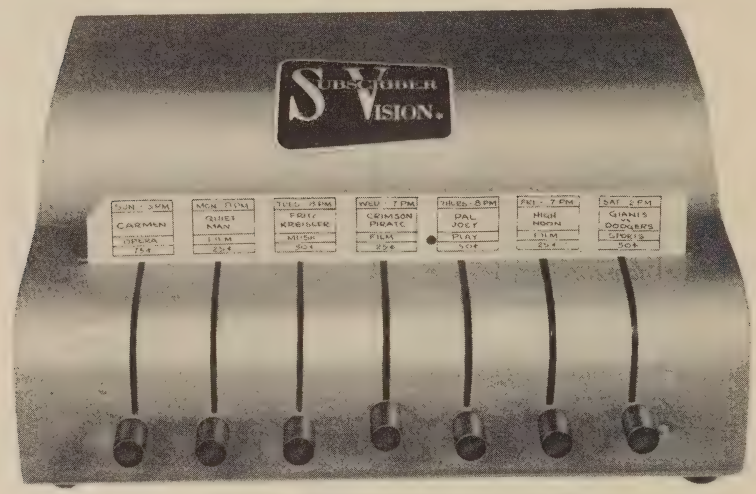


Fig. 27A. Typical S-V Decoder Unit.

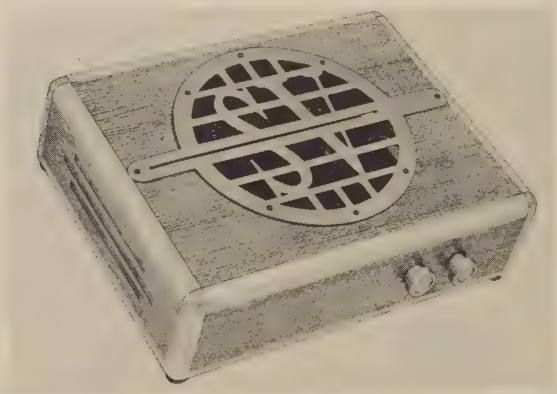


Fig. 27B. Skiatron's 1954 Mass Production Type Decoder.

In the subscriber's home, however, the television program has been clarified by means of the decoder which we are about to describe. Now the picture and sound are received just as they would have been had the coding and decoding devices not been used. At this point we

may review the details of the decoder which is located in the subscriber's home. Fig. 27A shows the decoder Skiatron has demonstrated to the FCC and the public. Fig. 27B is Skiatron's mass production type decoder, developed in the summer of 1954.

The decoder pictured in Fig. 27A is a small box which connects to the rear of the television receiver. There is a small slot in the top into which a card (Fig. 28) is placed. This card contains all of the decoding information, necessary to unscramble the picture, in the form of a printed circuit along its lower edge. In addition to the printed circuit, there are also holes punched in the card.

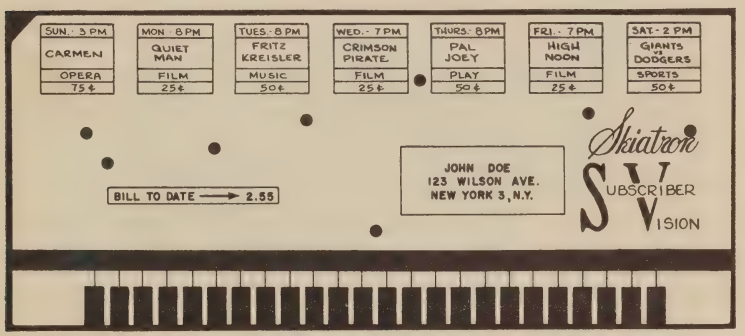


Fig. 28. The Card Containing the Decoding Information for Use in the Subscriber-Vision Decoder Unit..

A new card is issued for each time interval, a week, for example, and only the correct card for that week will decode programs. A number of push buttons are also provided, seven, if the system is set up for weekly card distribution. The button corresponding to the proper day and program must be pushed.

The card itself is of the business-machine type. It not only selects the right one of the possible 300,000 or more decoding combinations with the aid of the printed circuit, but it also automatically furnishes billing and addressing information by means of punched holes and acts as the bill itself.

The second form of decoder shown in Fig. 27B was designed to anticipate the requirements of mass production. This decoder employs a unique printed circuit which eliminates all wiring and greatly reduces assembling costs. A special connector is used to connect the decoder to the television set by means of plugging between the sockets and the actual tubes. In this manner, Skiatron hopes to adapt this decoder to all existing and new types of television receivers. The decoder circuitry in this unit may be removed for servicing by disconnecting the plug at the side of the unit and installing another in its place. This reduces the Skiatron service calls to a printed circuit replacement operation. In this arrangement, efficient servicing is

accomplished at a central depot where an automatic servicing machine locates the defects in the printed circuit chassis. This decoder may be used with a card containing one to four programs. A punch mark is made in a different part of the card for each program observed. If any of the selections shown on the card is not used, when the card is returned with his remittance, the customer receives credit for the unused programs.

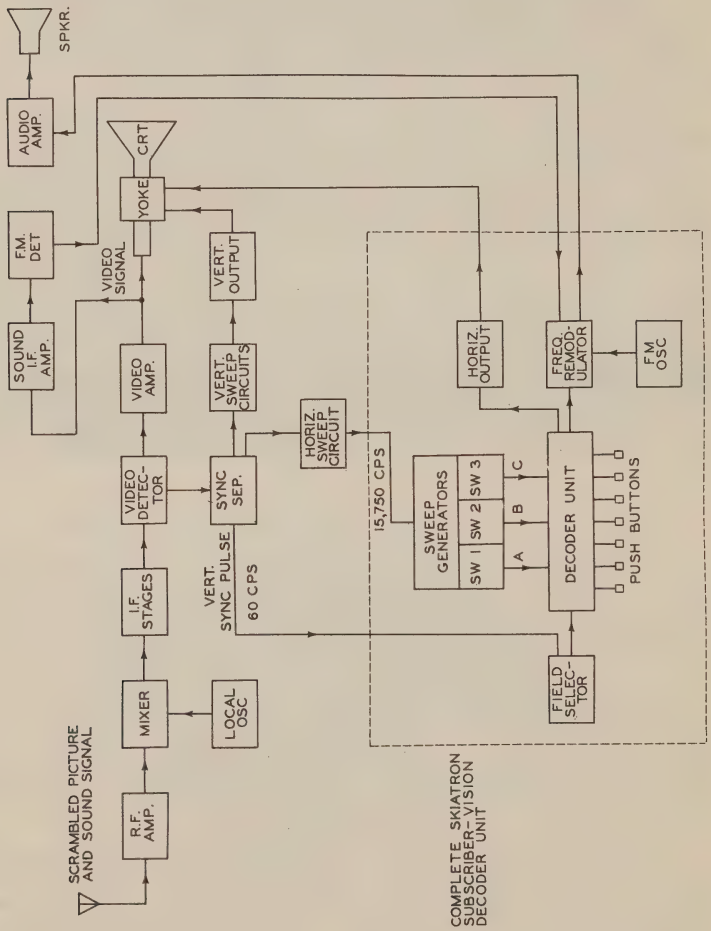


Fig. 29. Block Diagram of the S-V Decoder Installed in Typical TV Set.

A look at a block diagram of a TV set with a decoder attached, see Fig. 29, shows that the decoder appears to be almost exactly the same as the coding circuit except that now the decoder card contains

the information necessary to set up the field selector and the decoder unit of the equipment. Because of the printed circuit on the lower edge of the card, a number of wiring connections are actually changed in the decoder between each program, thus making the pattern of sweep waveforms selected in the receiver identical to those in the transmitter. Notice that, in the receiver, vertical synchronizing pulses and horizontal sweep voltages are fed into the decoder. Vertical synchronizing pulses perform the same function at the receiving end as they did in the transmitter, mainly, they set up the lines of demarcation between fields.

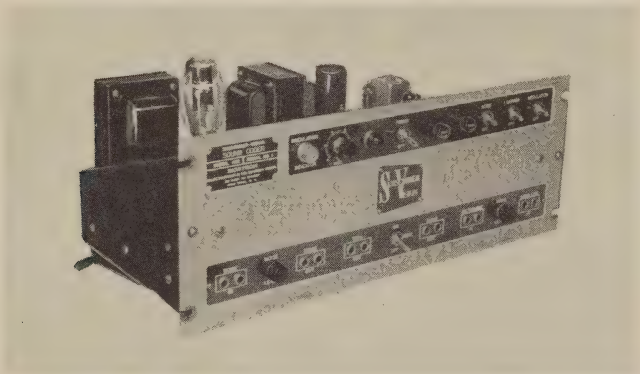


Fig. 30. Skiatron S-V Sound Coding Device.

In the receiving circuit, the horizontal sweep is converted into three sets of sweeps which are labeled: Sweep 1, Sweep 2, and Sweep 3, appearing on lines A, B, and C. The decoder card chooses the combination of square waves from the field selector corresponding to those at the transmitter and they in turn, select the proper sweep waveforms and feed a signal to the horizontal output stage supplying the horizontal deflection coil in the television receiver. The result is that the picture on the television screen has been stabilized by making the horizontal sweeps correspond exactly in their jitter with those at the transmitter. In addition to the picture unscrambling, Skiatron has, as previously described, a sound coding device (Fig. 30) and an unscrambling circuit in the decoder, see Fig. 29. The sound unscrambling process involves the removal of the sound signal from the FM discriminator in the receiver; this signal is then fed to the frequency remodulator, and finally back into the television receiver for clear audio reproduction. (This concludes the edited version of the paper by Mr. William Shanahan, Chief Engineer for Skiatron.)

Again it should be understood that the systems described herein were Skiatron's 1953 version and that this organization with its extensive laboratory facilities, see Fig. 31, has been proceeding with

further development. They claim to be ready at this time with a decoder which will work on the coin box principle. Essentially, both the coin box and the card type decoder are compatible. We may therefore conclude that the Subscriber-Vision system is capable of great flexibility of operation and is not limited to a single type of collection system. This organization is ready for subscription TV immediately upon the FCC approval.

Fig. 31. Section of Skiatron's Laboratory Facility.

Telemeter

Telemeter is a development of the International Telemeter Corporation of 2000 Stoner Avenue in Los Angeles. This Corporation was formed by two men whose names are synonomous with the movie industry, Carl Leserman and David Loew. Soon after this organization was formed the Paramount interests, with its enormous experience and support, became a part of this Corporation. In 1951, over KTLA, Channel 5 in Los Angeles, the first Telemeter demonstration was effected after the normal broadcast hours. Pictures of the scrambled type shown in Fig. 32 (A) were broadcast and cleared by placing money into a coin box of the type shown in Fig. 32 (B). The coin box device shown in actual use in Fig. 33, is the latest refinement to the original bulky Telemeters which had many moving parts and were delicate in construction. The Telemeter decoder in its present form works easily and simply and is built strong enough to withstand the worst treatment from the junior set. It is reasonably inexpensive when made in mass production and is easily attached to any existing television set with the proper conversion instructions. To best understand the Telemeter thinking, the author is presenting an excerpt from a speech given by Dr. Louis N. Ridenour and George

W. Brown, two outstanding and world renowned scientists who are part of the International Telemeter Organization. (The following has been edited only where necessary to conform with the format of this text.)

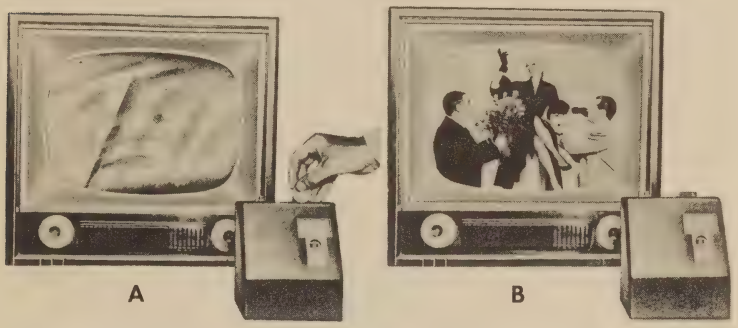


Fig. 32. (A) The Picture is Scrambled, But a Voice is Giving the Price (As Does the Small Window in the Middle of Telemeter) and the Necessary Coins Are Being Dropped In. (B) TV Screen Has Been Cleared — And the Show is On!

Fig. 33. Don Hartman, In Charge of Production at the Paramount Studios (left), and Norman Chandler, Publisher of the Los Angeles Times and the Owner of KTTV, at the Telemeter Opening in Palm Springs on Nov. 28, 1953.

The choice of the most desirable operating characteristics for a system of subscription television can be debated, and has been. No attempt will be made here to justify the choices which are characteristic of the Telemeter system, beyond remarking that they are based primarily on two main considerations: (a) convenience to the user of the system, and (b) maintaining as close as possible an analogy with practices which are standard and successful in existing forms of entertainment merchandising. Surely there can be no quarrel with the first consideration; the second has been adopted because of our belief that practices empirically arrived at through centuries of experimentation are likely to be sound. On these basis, then, we believe that the ideal subscription television system will have the following properties:

1. It must operate for cash. With minor and trivial exception, entertainment has never been successfully sold on credit. There is no reason to suppose that the introduction of television as a medium for merchandising entertainment will change things radically enough to overturn the empirically justified view that it cannot be. It is our belief that the only practical way in which cash operation of a subscription television system can be achieved is through the medium of a coin-actuated mechanism.

2. Prices for individual programs must be capable of being varied. Since the production costs of different programs are different, and the value to the viewer even of the same program may be different at different times (e. g., first-run, second-run and third-run motion pictures), a subscription system which operates on a fixed-price basis has surrendered much of its potential flexibility and usefulness.

3. Shows must be sold on a program basis, not on a time basis. A baseball game that goes twelve innings must still be shown in its entirety to a viewer who has paid admission; a person who pays for a motion picture being shown twice in an evening must be permitted to sit through two complete showings of the picture for one admission, if he so desires, just as he could in a theatre.

4. The identity, price, and current status of a subscription television program should be announced for the benefit of those tuning to the channel carrying it, at all times during the program. In the present Telemeter system, this is accomplished by means of an additional aural channel called the "barker", which is received when a subscriber tunes to a channel carrying a pay show. If the subscriber elects to purchase the show, the barker is replaced by the program sound as soon as the price of the show has been met. In the absence of some such provision, dependence must be placed on other means of informing subscribers as to the shows being offered. While much can be done through newspaper advertising, special weekly or monthly program circulars, spot announcements on radio and television, etc., we are of the opinion that the barker is a very important feature of a proper subscription television system.

5. An accurate record must be kept of every show purchased by every subscriber. While the primary requirement for making such a record lies in the fact that the producer of entertainment is accustomed to being paid on the basis of a percentage of the gross admissions, there are ancillary reasons which make it desirable to keep a complete and detailed record, as we shall see.

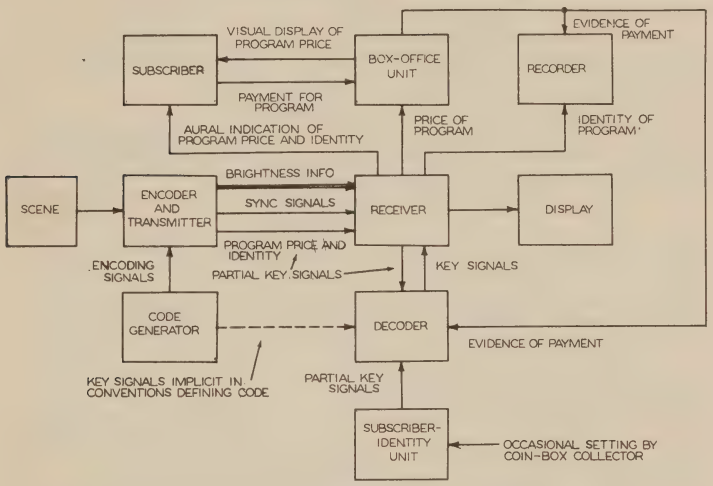


Fig. 34. Elements of the General Coin-Operated System.

The elements of the most general subscription television system, meeting the requirements specified in the last section, are shown in Fig. 34 together with the information-flow among the various units. The transmitter must be controlled by a code generator which both governs the convention used in encoding and also supplies for transmission, key signals that relate to the encoding method in use. The price and identity of the program must also be transmitted, usually in two ways. The "barker" gives to the subscriber an aural indication of price and program identity; at the same time, a suitably coded version of the program price must be transmitted to what we have called the "boxoffice unit." It is the function of this unit to display the program price, to receive the coins deposited in it by a subscriber who wishes to purchase the program; and upon receipt of the full program price, to present evidence of payment to the decoder which thereupon commences to decode the program; and to the recorder, which thereupon makes a record of the identity of the program purchased. Coded program-identity signals must also be transmitted, in order to enable the recorder to work.

It will be apparent that the decoder receives information from several sources. We have already noted that it is put into action by an evidence-of-payment signal from the boxoffice unit; this signal may or may not play a part in the actual decoding process, as we

shall see presently. In addition, the decoder receives the key signals which the transmitter is sending to accompany the program, it has, implicit in its construction, some set of conventions defining a class of possible encoding methods, and it may receive from what is called the "subscriber-identity unit" further key signals that play a role in the decoding process. The function of the subscriber-identity unit will become evident as the discussion proceeds.

The fundamental organization of any subscription television system meeting the requirements we have laid down is that shown in

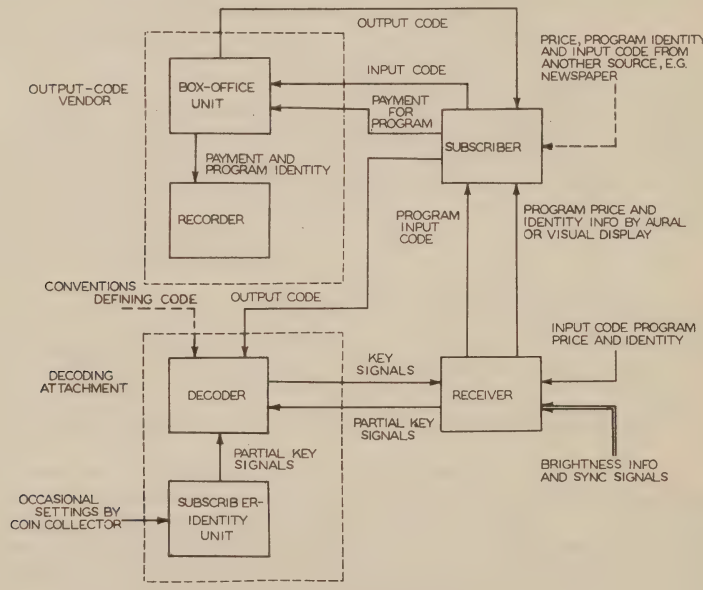


Fig. 35. The Coin-Operated System with Subscriber Intervention; Remote Vendor.

Fig. 34. Detailed variation in the system design arises, depending on the manner in which the four units of the subscriber's attachment — boxoffice unit, recorder, decoder and subscriber-identity unit — are associated with one another.

For example, consider Fig. 35. Here, by calling upon the subscriber himself to assist in the transport of decoding information, we have reduced to a minimum the amount of apparatus which must be electrically connected to the subscriber's receiver. The boxoffice unit and the recorder have been associated in a device called a "vendor", which can be physically isolated from the "decoding attachment"; indeed, a single vendor can, if desired, serve a number of subscribers. Only the decoder itself and the subscriber-identity unit are associated in the individual decoding attachment.

The system shown in Fig. 35 operates as follows: The subscriber is informed (e. g. , by the barker) of the nature and price of the program available on the channel to which he is tuned, and he is given in addition a code message which characterizes the program. This code message must contain an indication of the price and identity of the program, in order for the vendor to work satisfactorily. The subscriber then goes to the vendor and enters the code group characterizing the program, and another code group which serves to identify the subscriber himself. On the basis of these items of information, which together comprise the "input code" of Fig. 35, the vendor prepares itself to receive payment for the program. Upon the subscriber's meeting the price asked for the program, the vendor makes a recording of the identity of the program purchased and the subscriber's identity; it then presents to the subscriber a new code group (the "output code") which may simply be a message or alternatively may take some physical form, such as that of a code card.

The subscriber now returns to his set and enters the output code into its decoding attachment. On the basis of this information and that supplied it by the subscriber-identity unit, the decoder is actuated and the program is decoded. We now see one reason for the subscriber-identity unit. Without it, the full code required by the decoder would be available to the subscriber, and this code would be the same for all subscribers. Collusion among subscribers would then enable a single output code purchased by one subscriber to be used by the entire group, without any record being made of this fact, since the recorder is located in the vendor. It is therefore necessary to render each output code unique to each subscriber, which can be done by causing the input code, and therefore the output code, to be unique to each subscriber. The various individual output codes are then all translated back into the proper decoding pattern through the intervention of the subscriber-identity unit, whose settings have been chosen to match the variations in output code produced by the subscription-identity part of the input code.

The system of Fig. 35 represents the maximum degree of subscriber intervention in the decoding process which we think is at all feasible. Fig. 36 shows a system which is more nearly automatic.

In Fig. 36, the boxoffice unit and the recorder which together comprise the remote vendor of Fig. 35, are associated with the decoder and the subscriber-identity unit in the subscriber's attachment, which must be physically and electrically joined to the television receiver. The information on program price and identity reaches the attachment directly from the television receiver, without the intervention of the subscriber. The output code is presented to the subscriber, who enters it into the decoder. As in the system of Fig. 35, and for the same reasons, a subscriber-identity unit is necessary to handle output codes which are unique to each subscriber. The part of the input code which represents the subscriber's identity can be set into the recorder and boxoffice unit in a semipermanent fashion, since the entire attachment is, and remains, in the possession of a single subscriber.

Another possible system is shown in Fig. 37. Here the subscriber intervenes to enter the input code, which has reached him via the receiver, perhaps through the agency of the barker. As in Fig. 36 the subscriber-identity part of the input code is built into the attachment and need not be entered each time the equipment is used. The output code now goes directly from the boxoffice unit to

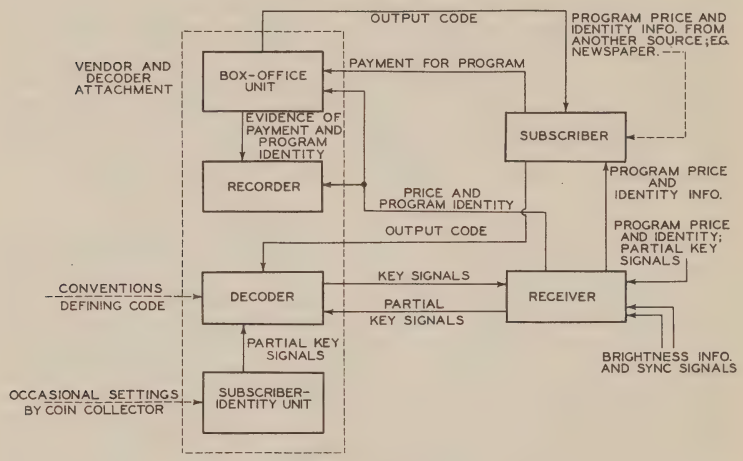


Fig. 36. Coin-Operated System with Subscriber Intervention; Automatic Input Code.

the decoder, entirely within the attachment. Under this arrangement, there is no longer any necessity for a complicated output code, nor for one unique to each subscriber. Since the output code is entirely unavailable to the subscriber, it can consist simply of the closing of a relay which actuates the decoder. An optional subscriber-identity unit is shown, for reasons which will become clear in a moment.

Actually, when the attachment to a subscriber's set includes the boxoffice unit and the recorder, as well as the decoder, both the input code and the output code may as well be made automatic. This produces some simplification in the equipment and also represents a system which makes the minimum demands upon its user. The resulting fully automatic coin-operated system is the one used by Telemeter. Its logical organization is shown in Fig. 38.

Price and program-identity information reach the Telemeter attachment directly from the television receiver; the price of the program is displayed visually to the subscriber by the boxoffice unit. Payment of the program price by the subscriber actuates the recorder and the decoder. An optional subscriber-identity unit is shown in connection with this system, as it was in connection with that in Fig. 37.

While the subscriber-identity unit is not needed in either of the last-mentioned systems to guard the integrity of the output code, since this code never appears outside the closed box housing the attachment, such a provision may be useful for the following reason.

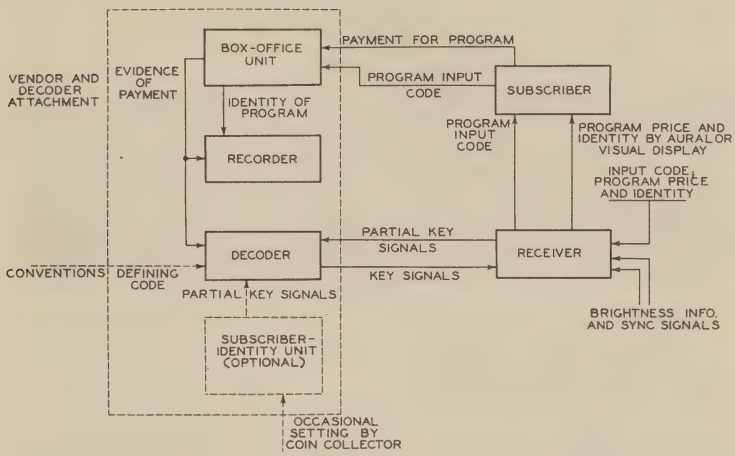


Fig. 37. Coin-Operated System with Subscriber Intervention; Automatic Output Code.

In any coin-operated system, a collector must periodically call to collect the coins that have been deposited in each home unit. The collector will occasionally find no one home when he calls, and will thus be unable to make a collection. One such failure to collect is tolerable, but two or more such failures lead to the danger that the coinbox will be overfull, or the recording medium used up, or both, before a successful collection is made. We may say parenthetically that this constitutes something of an argument in favor of the remote vendor, which can be placed where a collector can always have access to it. Nevertheless, the subscriber convenience afforded by the system of Fig. 38 seems to us sufficient to overwhelm this apparent advantage of the system shown in Fig. 35.

The difficulty just mentioned can be ameliorated by the use of a subscriber-identity unit, not to identify any particular subscriber, but rather to indicate that a sufficiently recent call by a collector has been made. That is, the subscriber-identity unit used in this fashion may be provided with a code sufficiently redundant so that its June setting by the collector will operate for July and August, but not September, and so on. This will permit one unsuccessful call by the coin collector, but no more than one; if a second unsuccessful call is made, soon thereafter the Telemeter attachment will no longer operate satisfactorily. Occasional settings of the subscriber-identity unit by the coin collector have been indicated in Figs. 34 to 38 inclusive, to

provide for this use of the unit. (This concludes the edited portion of a speech given by Dr. Louis N. Ridenour and George W. Brown of the International Telemeter Corporation.)

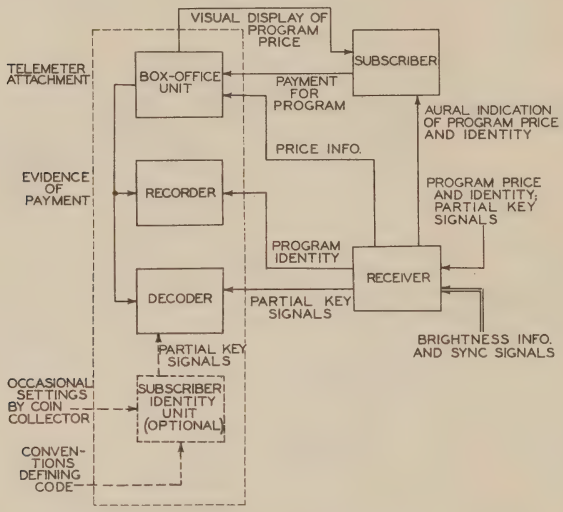


Fig. 38. Telemeter: A Fully Automatic Coin-Operated System.

Fig. 39 pictorally shows how the practical Telemeter system works. Fig. 40 discloses the coin-box construction. For another analysis it may be said that one of the current Telemeter systems transmits its video and audio on a code different than that used in standard telecasting. A television set receiving these altered codes without a Telemeter decoder unit will of course show the unintelligible picture shown in Fig. 32 (A), and will reproduce sound different from the sound intended to accompany the program being telecast over the Telemeter system. The TV set which has a Telemeter decoder will of course have the same unintelligible picture before the subscriber buys the program by putting the right amount of money into the Telemeter coinbox, and it will reproduce a special sound channel as previously called the "barker" by Dr. Ridenour. The barker will announce at frequent intervals, on a specific TV channel which is carrying the program, the nature of the program which is being or will be presented, the cost of the program, and the time at which its telecast started. In addition to receiving the barker sound channel the Telemeter system telecasts a chain of coded pulses which actuates various circuits in a Telemeter decoder unit. Part of this code is used to provide the visual indication which tells the user how much the program costs. The balance of the code will provide the information necessary to clear the picture and to transfer the audio from the barker channel to the proper sound which is synchronized with the

picture. The code pulses are transmitted at 50 millisecond bursts of modulation of an audio carrier with 50 millisecond intervals of no modulation in between. Modulation consists of one or the other of a pair of ultra-sonic frequencies; 20 KC and 22. 2 KC are now used. By taking care to avoid keying transients, it is possible to transmit these coded pulses without effecting the quality of either the picture or the sound received by a subscriber who has paid for the Telemeter program. In order to telecast the Telemeter program material and the

step 1 The family decides to see a special Telemetered TV show on channel 6 as advertised in the newspaper...the cost $1.15.
step 2 Mother turns to Channel 6; the Barker's voice is announcing the show . . . the stars of the show . . . the price ($1.15) and the starting time.
step 3 Telemeter instantly racks up the price ($1.15)...the voice of the Barker giving the starting time and price, is still repeating his message.
step 4 $1.15 is dropped in the coin slot and the price indicator in the window then indicates "paid" . . . the voice of the Barker stops and the show is on —
step 5 The family sits back to see and enjoy the finest in Television entertainment with no interrupting commercial.
step 6 Periodically th Telemeter service man calls at th house . . . takes the coin box an magnetic tape and substitutes new box and new tape.

Fig. 39. How Telemeter System Works.

special coding pulses, the TV broadcast station must have adaption equipment which is furnished by Telemeter for controlling the coded pulse signals which indicate the price and identify the program along with the coding process. One of the more unique features of the Telemeter system is that if a subscriber who has bought a Telemeter program tunes away from the channel on which that particular program is being presented, the decoder will recycle. Then, if the subscriber tunes his TV set back to this paid channel he has abandoned, he must buy the program again if he wants to see the remainder of the show.

The Telemeter people have analyzed it this way — that this recycling corresponds to standard practice in theatres and other places of amusement where if a patron leaves in the middle of a show, he must again pay at the boxoffice in order to be readmitted. However,

aware of the problems that this feature might cause, information is provided on the tape recorder which would indicate the fact that the same program was purchased twice. This enables the company to provide a refund when such information is shown on the tape recorder when it is picked up as in Step 6 of Fig. 39. This refund arrangement was considered very important as it would be very easy for junior, a blown fuse, or other possible interruptions in commercial power to recycle the decoder.

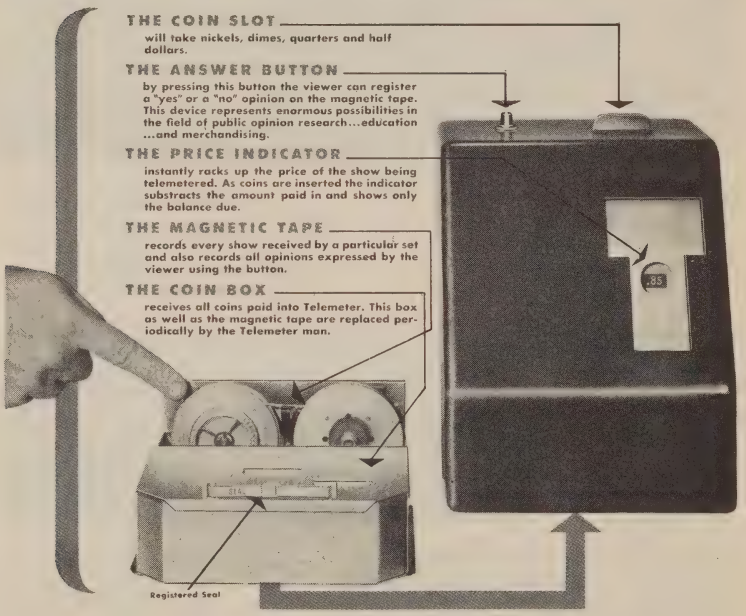

THE COIN SLOT
will take nickels, dimes, quarters and half dollars.
THE ANSWER BUTTON
by pressing this button the viewer can register a "yes" or a "no" opinion on the magnetic tape. This device represents enormous possibilities in the field of public opinion research...education ...and merchandising.
THE PRICE INDICATOR
instantly racks up the price of the show being telemetered. As coins are inserted the indicator substracts the amount paid in and shows only the balance due.
THE MAGNETIC TAPE
records every show received by a particular set and also records all opinions expressed by the viewer using the button.
THE COIN BOX
receives all coins paid into Telemeter. This box as well as the magnetic tape are replaced periodically by the Telemeter man.
.85
Registered Seal

Fig. 40. Details of Telemeter Coin Box.

SECTION III

CLOSED CIRCUIT TV

Closed-circuit TV transmission is exactly the same as television broadcasting except that there is no on-the-air broadcasting. The programs are picked up by means of a master antenna system and retransmitted from a pseudo studio to the television sets by a system of wire lines (coaxial cable) and distribution components. This method of transmission is not subject to ordinary broadcast rules and regulations.

Closed-circuit TV broadcasting may be done over community antenna systems, apartment house TV master-antenna systems, and through hotel TV master-antenna systems. All of these master-antenna systems are easily adapted to pay-as-you-see broadcast equipment devices.

Community Antenna Systems

There are many cities that are on the fringe or superfringe area of TV reception from metropolitan cities. For example, a city which is 100 or 120 miles away from New York, Chicago, Kansas City, Tulsa, Los Angeles and so forth, may be able to receive consistent and reasonably stable reception by constructing a giant receiving tower, or an antenna mast on the top of the highest point in the community. At this site, the optimum antenna location is determined and special sensitive electronic equipment is installed which amplifies the very weak TV signals to a very high level. If there is more than one station which can be picked up at this point, an antenna is erected for each of the television channels that can be received and they are amplified and mixed so that they can be retransmitted over one coaxial cable. The coaxial cables are then installed along power line or telephone poles which are existing throughout the community. Where necessary, new poles are installed. Depending upon the length of the cable between the antenna location and the various homes in the community, numerous relay amplifiers are located along the lines at selected points so that each home, regardless of location, will receive dependable pictures similar to that which they would have received if they were living within the confines of the metropolitan area where the telecast originated.

There are numerous technical and economic problems involved in community television systems. There is a tremendous coordina-

tion problem involving permits from municipal governments for installations of cable and electronic equipment and additional poles when required. Cooperation is necessary from power and telephone com-

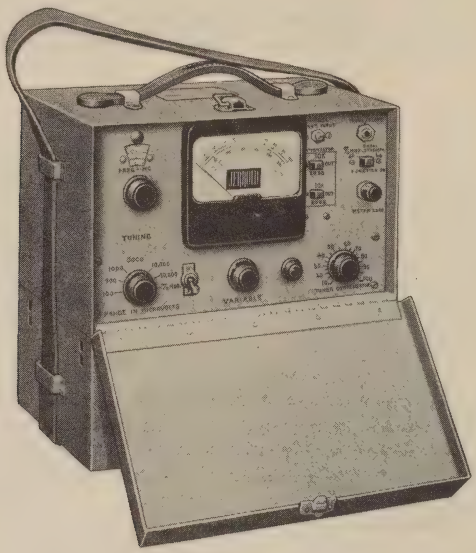


Fig. 41. Sensitive Field Strength Meter Designed for Portable Use in Testing Signals at Antenna Sites.

panies on the use of existing utility poles. Leasing antenna sites, obtaining permits for crossing railroads and state highways and the development of agreements which are satisfactory to community governments are other problems which must be considered. The selling to potential subscribers, and local technical problems require the training of special sales and installation personnel. Regardless of all the factors involved, hundreds of cities have overcome these problems and have installed community TV systems. The major organizations which have developed equipment and supervisory personnel for community TV installations are as follows (in alphabetical order): The Amplivision Division of the International Telemeter Corporation, Jerrold Electronics Corporation, Philadelphia, Pennsylvania, The Radio Corporation of America in Camden, New Jersey, and the SKL Laboratories in Cambridge, Massachusetts.

For the more specialized reader we shall present the more technical side of Community TV Systems, before describing its importance in the subscription TV field.

As in the proverbial chain, there can be no weak link in the Community TV System. To best analyze the technique of installing

community antenna systems, we should first understand the problems which must be solved in the area where the installation is to be made.

The sources of signal must be tested at various antenna sites with a field strength instrument of the type shown in Fig. 41. Tests should be made several times; day and evening, to determine the

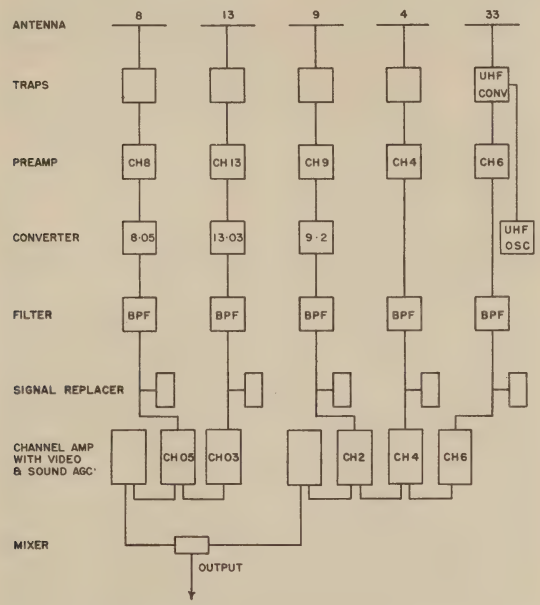


Fig. 42. Head-End Equipment Used in the Jerrold System.

normal signal variations which may be expected from eacn signal source. Assume that five TV stations can be received — Channels 8, 13, 9, 4, and 33 from urban areas in various polar directions. Referring to the Jerrold diagram (Fig. 42) we must first install a high-gain directional yagi for each TV channel in order to realize the maximum signal. The signals from the yagi antennas for Channels 8, 13, 9, and 4, are fed to traps to help clear them of interferences. The Channel 33 yagi feeds a UHF converter which converts the UHF channel to VHF channel 6 (82-88 megacycles). The conversion is done immediately, because of the very high cable losses at UHF, and the difficulty of amplifying UHF signals at the present stage of the vacuum tube art.

At the next stage called "PREAMP", the signals for Channels 8, 13, 9, 4, and 6 are amplified to compensate for further cable loss. The amplified signals of Channels 8, 13, and 9 are fed to converters which convert Channel 9 (186-192 megacycles) to Channel 2 (54-60 megacycles), Channel 8 (180-186 megacycles) to what the Jerrold

Corporation calls Channel 05 (40-46 megacycles) and Channel 13 (210-216 megacycles) to Channel 03 (24-30 megacycles). These 05 and 03 Channels may be considered sub-TV frequencies which are subsequently converted, in the Jerrold System, to Channels 5 (76-82 megacycles) and 3 (60-66 megacycles) respectively.

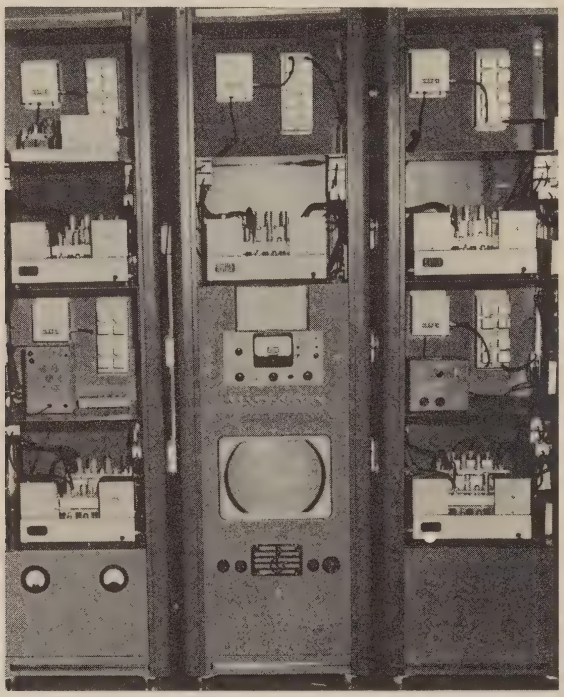


Fig. 43. Jerrold Rack-Mounted 5-Channel Antenna Site Equipment.

At this point we have all the TV signals below 88 megacycles which will keep cable losses to a minimum. The band-pass filter and signal replacer provide the proper circuit characteristics for stable input to Jerrold's individual channel amplifiers with video and sound AGC (Automatic Gain Control). These individual amplifiers automatically adjust their gain to compensate for the changing levels received at their inputs, due to weather and climatic variations, which affect the strength of TV signal transmissions.

The outputs of the individual channel strips are fed to a mixer which mixes the signals so that they can be distributed over one common coaxial cable. Fig. 43 shows the physical equipment which approximates the assembled units shown on the diagram of Fig. 42.

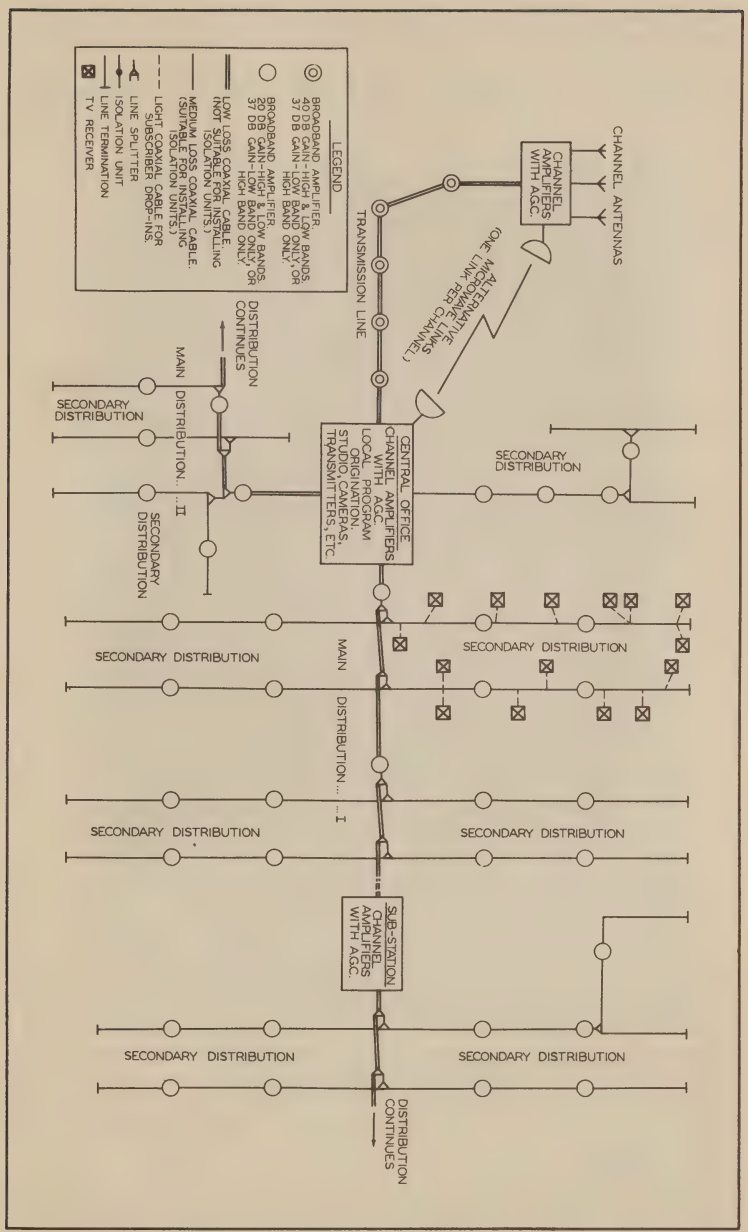

LEGEND
BROADBAND AMPLIFIER 40 DB GAIN - HIGH & LOW BANDS 37 DB GAIN - LOW BAND ONLY, OR HIGH BAND ONLY.
BROADBAND AMPLIFIER 20 DB GAIN - HIGH & LOW BANDS 37 DB GAIN - LOW BAND ONLY, OR HIGH BAND ONLY.
LOW LOSS COAXIAL CABLE. (NOT SUITABLE FOR INSTALLING ISOLATION UNITS.)
MEDIUM LOSS COAXIAL CABLE. (SUITABLE FOR INSTALLING ISOLATION UNITS.)
LIGHT COAXIAL CABLE FOR SUBSCRIBER DROP-INS.
LINE SPLITTER
ISOLATION UNIT
LINE TERMINATION
TV RECEIVER
CHANNEL ANTENNAS
CHANNEL AMPLIFIERS WITH AGC.
ATTENUATING MICROWAVE LINKS (ONE LINK PER CHANNEL)
TRANSMISSION LINE
CENTRAL OFFICE CHANNEL AMPLIFIERS WITH AGC. LOCAL PROGRAM ORIGINATION STUDIO, CAMERAS, TRANSMITTERS, ETC.
SECONDARY DISTRIBUTION
MAIN DISTRIBUTION ... II
DISTRIBUTION CONTINUES
SECONDARY DISTRIBUTION
SECONDARY DISTRIBUTION
SECONDARY DISTRIBUTION
MAIN DISTRIBUTION ... I
SECONDARY DISTRIBUTION
SECONDARY DISTRIBUTION
SUB-STATION CHANNEL AMPLIFIERS WITH AGC.
SECONDARY DISTRIBUTION
SECONDARY DISTRIBUTION
DISTRIBUTION CONTINUES

Fig. 44. Typical Layout of Ampli-Vision Community TV System.

The TV picture screen serves as a monitor for the personnel maintaining the units which make up the antenna site equipment.

Fig. 44 shows a complete layout of an Ampli-Vision Community TV System. Fig. 45 is the Ampli-Vision 3-Channel antenna site

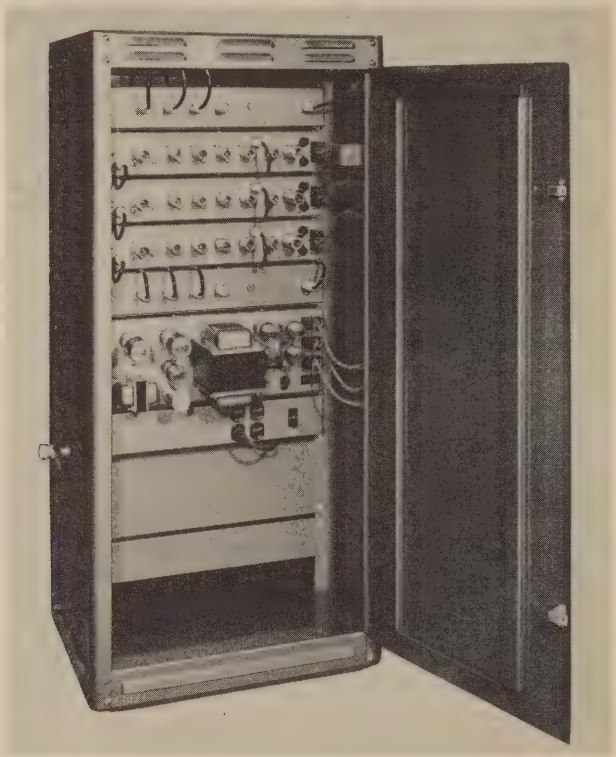


Fig. 45. Ampli-Vision 3-Channel Antenna Site Equipment.

equipment, and Fig. 46 is their monitor. Note that in the Ampli-Vision layout the output of the amplifiers at the antenna site is shown connected to the Central Office, usually located many miles away, by either one transmission line with interim booster amplifiers, or by microwave links. The economic analysis determines the selected method. Micro-link operation requires the constant service of an FCC-licensed operator, the preparation of FCC applications, and maintenance of continuous FCC records in accordance with the prescribed laws.

Fig. 47 shows a close-up of an Ampli-Vision Broadband Amplifier. Unique in this design is the fact that any amplifier tube may fail without disturbing the performance of the amplifier or the system.

Working on the "travelling wave" principle, each tube contributes approximately 1.75 db to the overall gain of the amplifier strip, making the overall estimated peak gain 21 db. Fig. 48 shows an Ampli-Vision 40 db broadband repeater, where one broadband amplifier drives another. As these units are installed in pole boxes, maintenance is reduced to routine tube replacement.

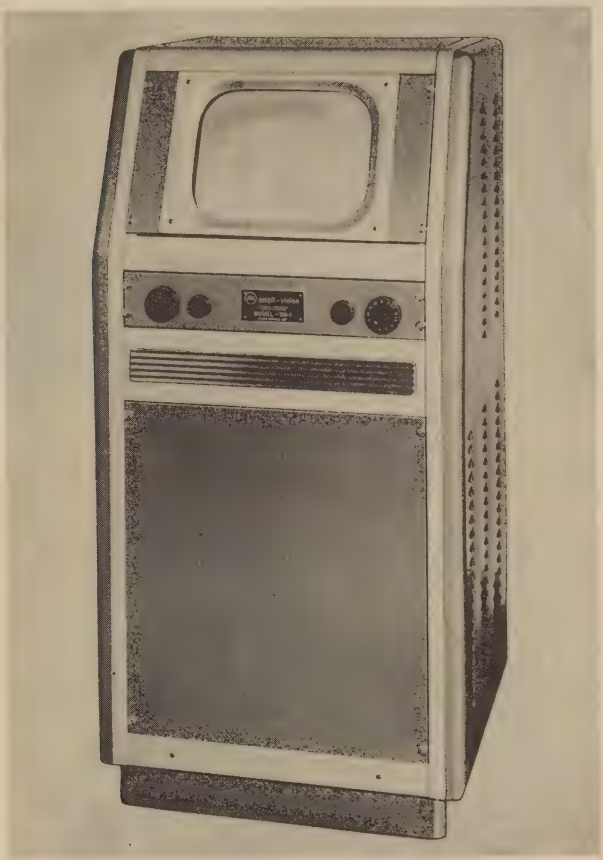


Fig. 46. Ampli-Vision Community System Monitor or Studio Console.

For the technician, Fig. 49 illustrates the principle of the travelling wave amplifier which consists of two distributed amplifier stages in cascade. In the distributed amplifier all grids are equally spaced along a grid delay line, and all plates are equally spaced along a plate delay line. The delay times of both lines are equal.

TV signals fed to the input terminal are amplified in the first tube. The amplified signal at the plate of this tube starts down the plate delay line toward the plate of the next tube at the same instant that the original signal starts down the grid delay line toward the grid

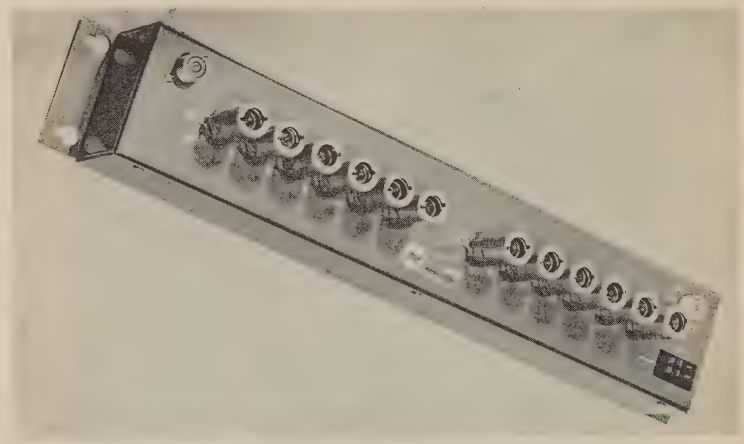


Fig. 47. Ampli-Vision Broadband "Traveling Wave" Amplifier.

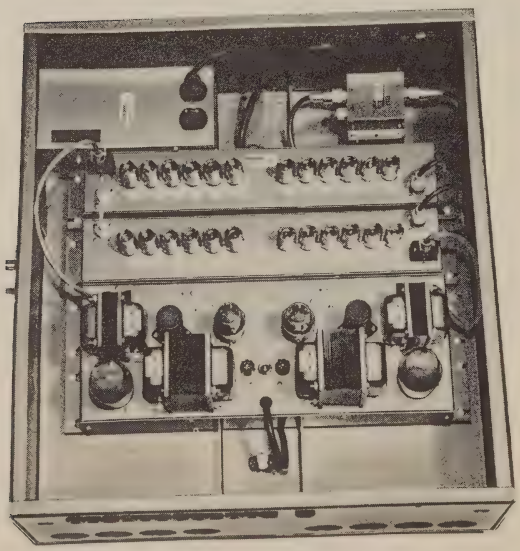


Fig. 48. Ampli-Vision 40 db Broadband Repeater Station.

of the next tube. As the plate and grid lines delay the signal equal amounts, the grid and plate signals reach the next tube at the same instant. At this point the grid signal is amplified again and added to the plate signal.

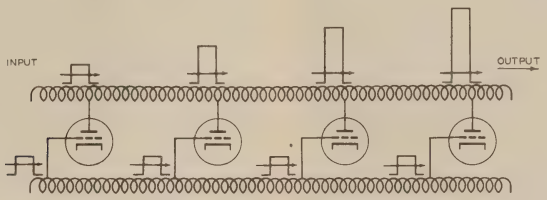


Fig. 49. Circuit of Delay Line "Traveling Wave" Type Amplifier.

The number of repeater-booster amplifiers, line equalizers, tap-off devices and additional central station equipment required, will depend on the length of the cable runs, size of the town, number of subscribers, etc. Figs. 50A thru M shows partial assembly of components of Jerrold and Ampli-Vision Community TV Systems. It should be noted that much of this equipment is designed with quality comparable to telephone company standards.

Community TV Systems as we shall see in the next paragraph, offer one of the largest captive markets for the immediate operation of subscription TV.

Pay As You See TV Over Community Antenna Systems

The International Telemeter Corporation using its Ampli-Vision Community TV Antenna System, made the first installation of a combined community TV and pay-as-you-see system. Selecting the California winter resort of Palm Springs, this Corporation, through its subsidiary, the Palm Springs Community Television Corporation, made installations at an average price of $150.00 per home in the Palm Springs area. Here are some of the facts which were developed by Telemeter as a result of its experimental installation.

On November 28, which was the opening day, there were approximately 512 TV sets connected to the system. Only 71 of these sets had a Telemeter decoder ready for the special program material. By January 30, 1954 there were 614 TV sets connected to the Palm Springs system and 148 television decoders installed. From the results of a survey, it was believed that the future would show that between 80% and 90% of all TV owners in Palm Springs would eventually subscribe to the Telemeter system. To prove the flexibility of the adaption of the Telemeter system, among the first 70 TV sets which were converted for use with the Telemeter decoding device there were approximately 28 different types and kinds of television

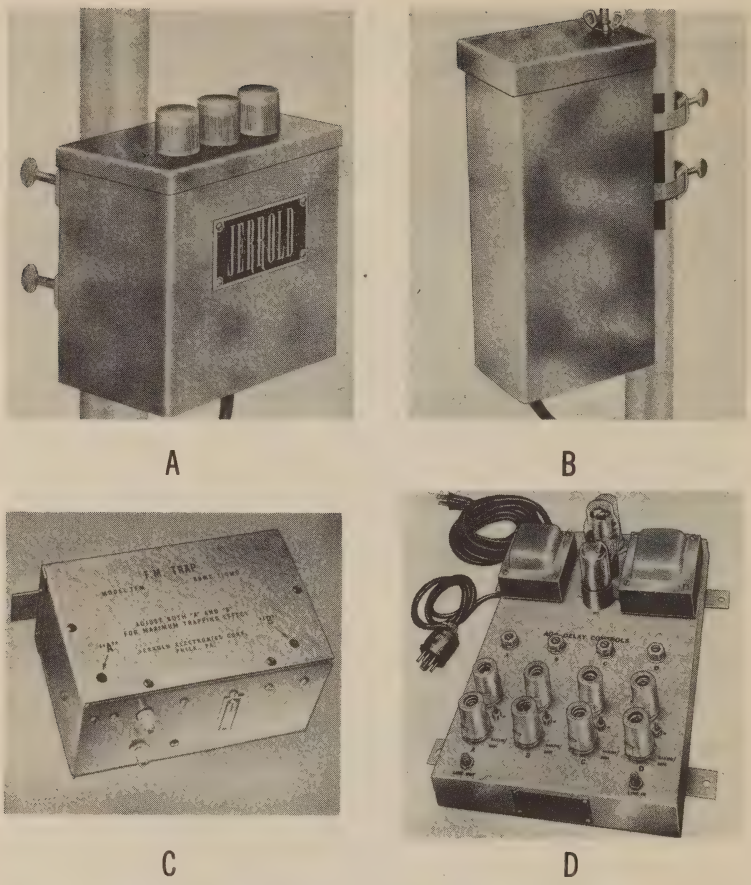
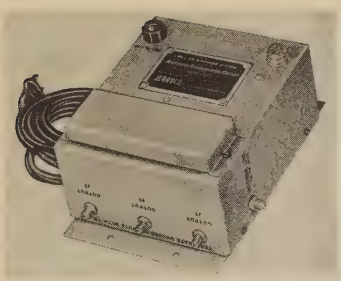


Fig. 50(A.) UHF Converter Head, (B.) Preamplifier — Used in Fringe Locations and Usually Mounted on the Mast Close to the Antenna, (C.) FM Trap, (D.) AGC Control for Use With Closed Circuit Television to Adjust Amplifier Gain for Different Input Levels. This Unit Controls Four Strips.

sets. On March 1st Telemeter issued a report that the Notre Dame-USC game was seen by almost 97% of all subscribers who had Telemeter decoders. First run movies furnished by Warner Bros., MGM, United Artists, Republic, and Paramount, such as "Here Come The Girls", "Forever Female", "Fort Bravo", "All The Brothers Were Valient", which ran the same day at the local Palm Springs movie theatre, averaged 85% subscription via Telemeter. It was noted that pictures running via Telemeter two to six months after the local theatre play date realized only 50% to 60% of the potential. Some



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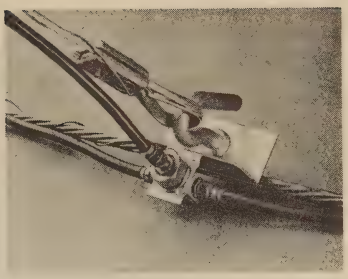

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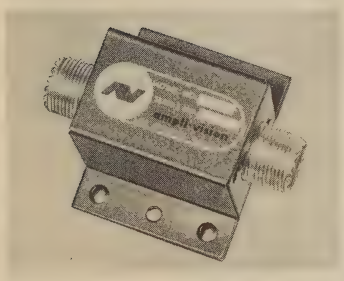

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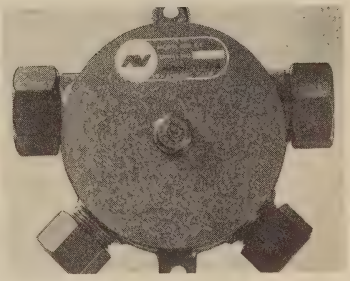

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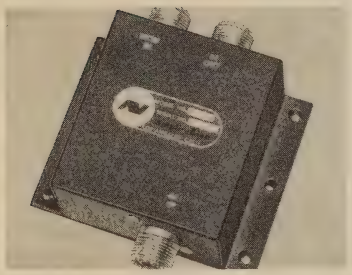

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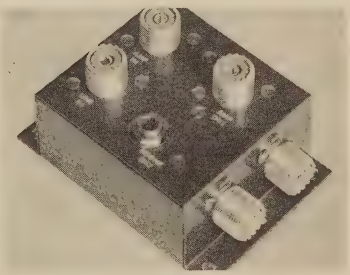

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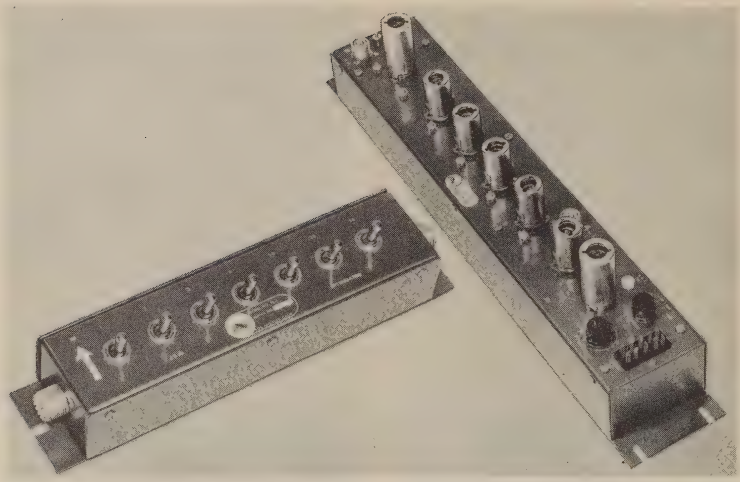
Fig. 50(E.) Jerrold 3-Outlet Antenna Distribution Unit, (F.) Jerrold Tap-Off Unit, (G.) Ampli-Vision Attenuator Unit, (H.) Ampli-Vision Isolation Unit, (J.) Ampli-Vision Line Equalizer, (K.) Ampli-Vision Bridging Terminal.

excerpts from Carl Leserman's reaction to the first returns of Telemeter in Palm Springs are: "Telemeter averaging $10.00 per month per set — a much higher figure than hoped for. Convervative projection of $10.00 average on basis of national installation of Telemeter shows motion pictures and big sports events hitting multimillion dollar



L M

Fig. 50(L.) Ampli-Vision Step Attenuator, (M.) Ampli-Vision Channel Amplifier With Built-In AGC.

grosses with ease and regularity -- the near sell-out of the Notre Dame-USC game via Telemeter in Palm Springs indicates conservatively that such a game on a national basis with Telemeter could easily gross $10,000,000.00 on a Saturday afternoon."

During the first month of this community system antenna operation, there were a number of subscribers who bought 21 or more programs out of the 25 offered for sale. An indication of the program pricing was as follows: The Rams-Colts game was 25¢. The first run movies were approximately $1.35. Every movie was shown twice during the evening and the price for the first showing entitled the viewer to see the second show. This gave the viewer the same opportunity as if he had gone to the movie and had walked in at the middle of the first show. The professional Bowl game in Los Angeles, which was priced at $1.00, showed an 88% sale. Obviously, communities with community TV antenna systems with thousands of connections will be a natural market for pay-as-you-see TV. It is anticipated that this market will press for a fast start as soon as community TV system operators can get organized with program material.

In June, 1954 during the National Community Television Association show at the Park Sheraton, in New York, the Ampli-Vision Division of International Telemeter demonstrated its system of the type which is used at Palm Springs. To give the viewer a better idea of the community system operation, Figs. 51 through 54 show the Palm Springs installation. Fig. 51 shows the antenna site atop one of the San Jacinto mountain peaks outside of Palm Springs, California. Note that four highly directional antennas are installed to pick up the

programs from four Los Angeles TV stations. The signals are pre-amplified by the electronic equipment located in the metal house shown at the base of the antenna mast. The amplified signals are then transmitted by cable to the central studio located in the heart of Palm

Fig. 51. View of Palm Springs Community TV Corp. Antenna Atop One of the San Jacinto Mountain Peaks Outside Palm Springs, Calif.

Fig. 52. An Ampli-Vision Amplifier Atop One of the Poles Leading Into Palm Springs, Calif.

Springs. Fig. 52 shows an Ampli-Vision amplifier, used to keep the signal at the correct level, on top of one of the poles leading from the mountain into Palm Springs, California. These amplifiers are designed to be maintenance-free and are installed in weather-proof boxes to assure proper performance regardless of external environmental

conditions. Fig. 53 shows the racks used for both the community TV antenna system and those used for Telemeter purposes. Fig. 54 shows the Telemeter engineers monitoring the first-run movies being televised in Palm Springs over the community antenna system. The test period in Palm Springs may be now considered over and indeed very successful.

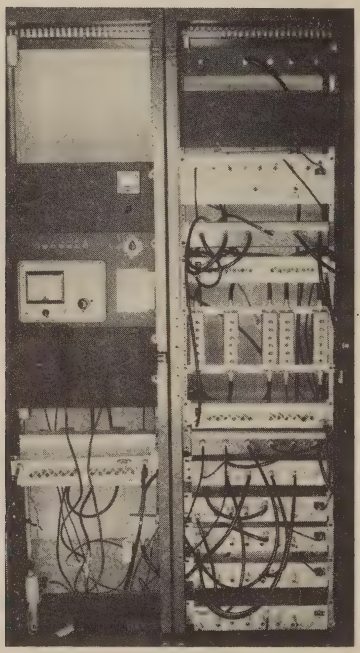


Fig. 53. Pictured Here Are Two Racks Used as Part of the Palm Springs Community TV Corporation's Operations. The Section at the Bottom (right) includes a Mixer Into Which Programs Originated By Telemeter Are Fed Into Channel No. 6 and Carried to the Subscribers Equipped to View Telemeter's Pay-As-You-See Programs in Palm Springs, California.

Considering the possibilities inherent in pay-as-you-see TV over community antenna systems (which are becoming more popular since the TV freeze and UHF), subscription TV over these ever increasing community TV antenna systems may be the starting point for a new field of television entertainment.

Closed Circuit TV in Hotels

Another great captive market available to the proponents of subscription television are those hotels which are equipped with TV

master antenna systems. There are perhaps, at the time of this writing, close to one hundred thousand hotel rooms throughout the country equipped with TV master antenna system outlets. In New York City, such hotels as the Astor, Commodore, Savoy-Plaza, Pierre, and the Waldorf are nearly fully equipped. In Chicago, the

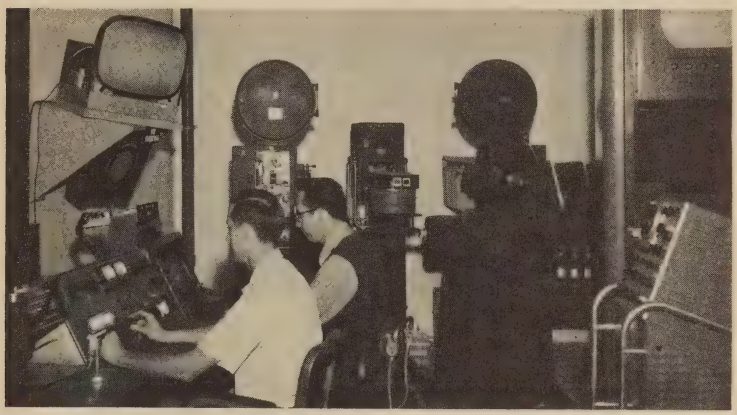


Fig. 54. Two Telemeter Engineers Monitoring First Run Movies Being Televised to Viewers in Palm Springs, Calif., Equipped With Telemeter Coin Boxes.

Conrad-Hilton, the Drake, the Palmer House, and many other hotels have TV installations in a majority of their rooms. Hotel groups such as the Sheraton, Statler, Schine, and Hilton, have as a matter of policy installed TV master antenna systems so their guests could be afforded the best in television. The majority of TV master antenna systems around the country are of RCA Manufacture, with associated RCA receivers, although there are many Jerrold installations with RCA receivers and other make television sets. Both Admiral and DuMont have made an effort to gain a foothold for their TV sets in hotels; however, RCA's long lead still leaves them the most dominant factor in the market as of 1954. Fig. 55 shows the president of RCA, Frank Folsom, with the President of the Commodore Hotel, and Arnold Wells of Wells Television. Unique in the RCA setup is the fact that it has appointed Wells TV, a New York City group, as its national distributor of TV master antenna systems and hotel TV sets for lease or resale to hotels in the greater part of the United States. Wells TV, in a great number of hotels, has leased both the antenna system and the television sets to the hotels and takes the full responsibility of operating and maintaining the systems. This plan accelerated the development of hotel installations as it relieved the hotel of the responsibility of maintaining technical personnel in order to keep their TV operations in good order. There are some hotels, such as the Waldorf, which have purchased their TV master antenna system and have an operating staff to maintain the sets and system.

Fig. 56 shows a few of the staff members who maintain the complex radio and TV installation throughout the Waldorf.

It is to be expected that by the end of 1955 nearly all the hotels throughout the country will be fully equipped with TV master antenna systems.

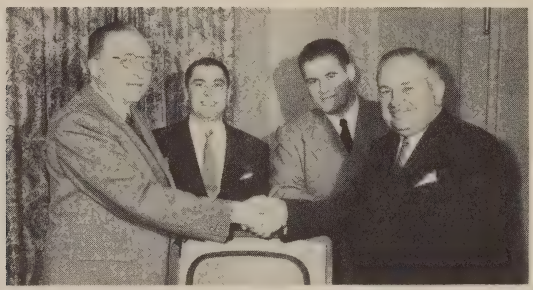


Fig. 55. Frank Folsom, President of RCA (right) Shaking Hands with E. Leslie Sefton, President, Hotel Commodore, New York City, Arnold Wells, (second from left), One of the Executives of Wells TV.

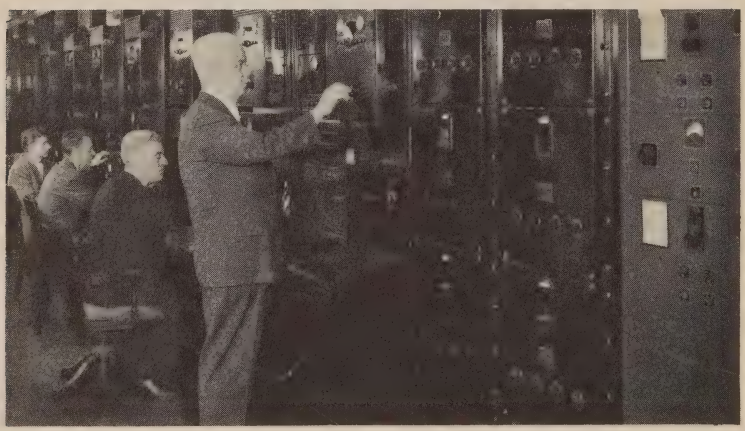


Fig. 56. Partial View of the Complex Waldorf Radio and TV Installation Maintained Under the Direction of Harry Martin (standing).

A hotel which is thoroughly equipped can provide more to their guests than just the program material which is being transmitted by the local TV station. In June, 1954 the Ampli-Vision Division of International Telemeter, in conjunction with Wells TV, made a series of daily telecasts to the 1600 television receivers installed in the guest

rooms of the Park Sheraton Hotel. Ampli-Vision used "studio equipment" which included a projector, camera, and miniature power transmitter which fed into the Park Sheraton master antenna system from an area which was less than 150 square feet. This area factor is very important to the hotel if it is to originate broadcasts from within the hotel, as space is always at a premium. The telecasts which were made in the Park Sheraton included a telephone message service for registrants of the National Community TV Association in which the names of persons who were wanted on the phone were listed on a call board in front of TV cameras and piped to all the rooms in the hotel. Obviously, this means that when a hotel is equipped with a TV master antenna system and some of the newly developed, low cost "studio equipment", it will be possible to provide convention data to dealers, distributors, or representatives attending hotels on a regional rather than a national basis thus reducing the tremendous travelling expenses. Furthermore, it is quite probable that local department stores and others will prepare program material, on where to shop, where to go, and what to do, for transmission through the hotels' closed circuit master antenna systems. Certainly, all hotels would like to feed their show from the hotel ballroom or night-club directly to the guest rooms with the known assurance that it will expand the revenue from room service. The occupants of hotel rooms are a ready market for subscription TV where some guests would be more than glad to enjoy the broadcasts of special events and feature movies from the confines of their own rooms.

Boxoffice Television

This is a New York organization which at the instigation of Wells Television, specifically worked out for closed circuit use in hotels with master antenna systems, a simplified subscription TV system. The Boxoffice TV System works in the following manner:

The audio and video signals are piped or transmitted by a common carrier such as the telephone company to each master antenna system which is a part of the network. This may be in a dozen or more hotels within the area or may be in a number of hotels throughout the country to which the transmission may be by coaxial line or microwave relay at the discretion of the carrier.

Up to this point, the audio and video signals are standard in every way. Part of the network may be a chain of TV theatres which will use the signals in their original form.

At each master antenna system is located the TV Picturecaster shown in Figs. 57, 58, and 59. This unit is a compact television transmitter and coder into which the audio and video signals are fed. The output of the Picturecaster is RF at the frequency of a regular TV channel which is not normally occupied in the particular location.

In New York, for example, Channel 13 was used for the Boxoffice transmission. The Picturecaster output is fed, not to an antenna, but to the input of the master antenna system, through which it is

distributed to every receiver on the system. The signals can be received on an ordinary receiver simply by tuning in the appropriate channel, and they do not interfer with normal reception of any other channel.

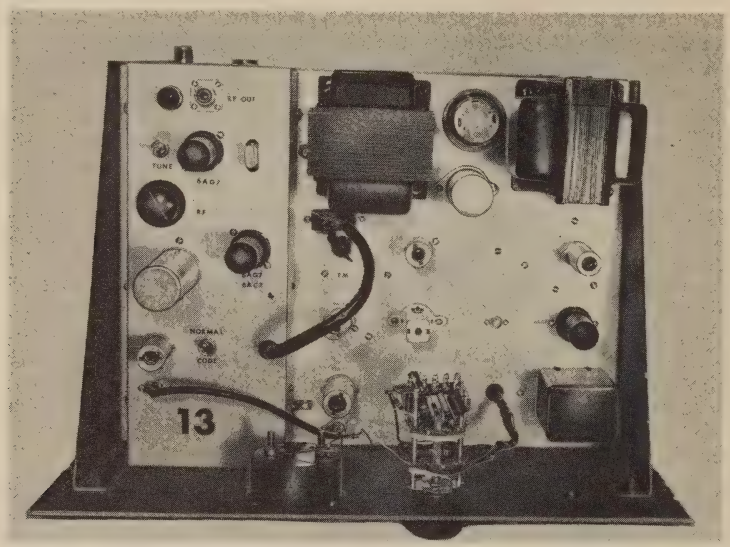


Fig. 57. Chassis Top View of Boxoffices Simplified Combination Closed-Circuit Channel 13 Audio-Visual Transmitter and Coder.

When used for pay-as-you-see programs, however, the video transmitted by the Picturecaster is coded or "scrambled" in such a way that, while the program can be tuned in the usual way, the picture is unwatchable — as shown in Fig. 60.

Decoding depends on the installation in the receiver of a special decoder unit with a compact, inexpensive vacuum-tube circuit which may, in most cases, be inserted into one of the receiver's tube sockets; plus a box with a keyhole. Once the decoder unit has been installed in the set, the viewer may decode his picture by inserting a key in the keyhole and turning it. In hotels, the key is rented for the evening from the desk clerk. The key rental is the fee paid for watching the program, a fee which varies with the type of program material. The key cannot be removed without returning the special program picture to its scrambled state.

Fig. 61 shows the simple decoding device with the key inserted in the lock. This decoding device can be installed in a matter of minutes. It was estimated by the proponents of Boxoffice TV that

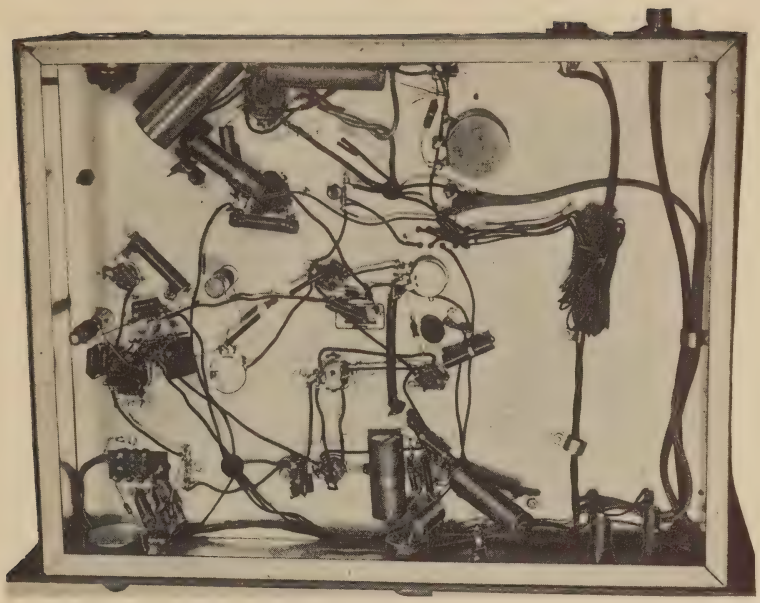


Fig. 58. Under Chassis View Showing the Components Required in the Boxoffice Design.

Fig. 59. Coding Unit RF Output Feeds Input of Master Antenna Channel 13 Amplifier Strip. When Programs are Transmitted to Guests on a Free Basis, the "Normal-Code" Switch is Placed in the "Normal" Position.

their cost for manufacturing the decoder was under $5.00. This would mean that, complete with the channel 13 Picturecaster (Fig. 57) and these simple decoding devices, a 1,000 room hotel could be made

fit and ready for subscription TV on a budget of less than $10,000. It could pay for itself in a matter of months, depending upon the number and quality of events which were available to the installation.

Fig. 60. Boxoffice Picture Scrambled. Unscrambled Picture is Clear Channel-13 Pattern.

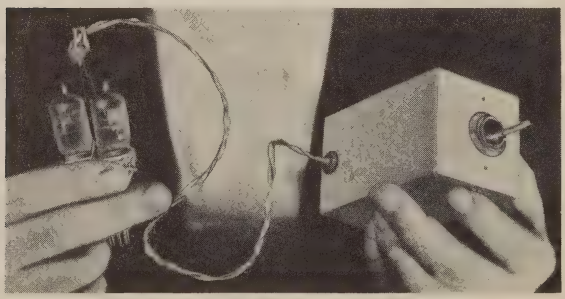


Fig. 61. Boxoffice Simple Key-Operated, Two-Tube Decoding Unit.

In early 1954, Richard H. Dorf, well-known audio and TV consultant, and one of the principals of the Boxoffice organization, disclosed a development of the Boxoffice TV system designed for on-the-air use. It was claimed that his new system was as simple an installation as the closed-circuit device (Fig. 61) described in the foregoing. However, no actual demonstrations have been made, at the time of writing, of this new on-the-air system. A resort hotel in Palm Springs, California was one of the first hotels to operate on the Telemeter system (Fig. 62).

Subscription TV for Multiple Dwellings

In important metropolitan areas throughout the country, the greater majority of new apartment houses constructed for the middle income group have been fitted with master antenna systems. Fig. 63 shows some of the leading planners in the country

Fig. 62. Carl Leserman (right), Executive Vice President of International Telemeter Corp., Shown with Harry Berlinger, Operator of Turquoise Villa in Palm Springs, Calif. Turquoise Villa Was One of the First to Have Telemeter Installed in Rooms.

in the architectural-engineering field reviewing their drawings with Frank Folsom, President of RCA. These plans started a pattern which resulted in the installation of more than a quarter-million outlets in various buildings in New York City. These quarter-million outlets from various TV master antenna systems provide a ready-made closed-circuit TV system for subscription television. In New York City, organizations like Amplitel (under the direction of such top financiers and business men as Harry Morris and Herbert Ardston), the Bell Television Corporation (with over 500 master antenna systems under its jurisdiction and operating with the guidance of such well known merchandisers and administrators as Lee Bunting and Martin Sugar), and Jerrold, New York, a subsidiary corporation of the Jerrold Electronics Corporation (which has over 8,000 master antenna installations throughout the country), provide a stability to the New York market which makes it ready for subscription TV as soon as the plans are ready.

Several schemes are underway for programs to be originated in a New York studio especially set up for the purpose (or, of course, from major sports arenas). These programs may be transmitted by cable and/or relay to apartment houses all over New York City and its environs. Each of the apartment houses served is equipped with a master antenna system which supplies all receivers in the building with signals from a single set of antennas.

The special programs will be fed into the master antenna systems, from which they will appear at each connected receiver just as if they came in over the air. The viewer simply tunes to the appropriate channel, just as he would tune in an ordinary program. His set will be equipped with a decoder if he is a subscriber. When he wants to watch a special program, he inserts the necessary coins or card.

Fig. 63. Left to Right (seated); Sylvan Bien, World Famous Architect; Edward Sears, Renowned Consulting Engineer; Frank Folsom, President of RCA. Left to Right (standing); the Author; Colonel Alexander Fisher, President of the Comercial Radio Sound Corp.; and Julian Roth of the Architectural Firm of Emery Roth and Sons.

In this way, each tenant of an apartment house equipped with a master antenna system can have access to special subscription programs, just as if the whole idea of subscription TV had been federally approved and all the "bugs" had been ironed out. Yet no federal approval may be required and the new system can start immediately — as soon as the plan is placed into operation and the legal problems solved. That all of the foregoing is fact and not theory is shown by the following.

From the technical and engineering standpoint, subscription TV systems have been developed to the point where they have proved workable, economical, and practical. Some of the systems have been tested by major master antenna operators and these systems work to their full satisfaction. The work to be done on each TV receiver

is practical and easily accomplished. Requirements for closed-circuit decoders are less because there is closer control over viewers, and "bootlegging" is less of a problem. Further development may evolve a simpler system for this use than those described in this text.

Transmission facilities are assured. The telephone company maintains coaxial cables within certain parts of the city and will undoubtedly install more cable in the very near future, very possibly at the specific request of the organizations developing this plan. Where cable does not reach or where cable is less economical, the telephone company or private microwave relay facilities may be used.

Almost one-third of the better apartment buildings in Manhattan now have master antenna systems, and more are being installed daily. In the near future, we can look forward to most such buildings having master systems as tenants and landlords discover the better reception and freedom from rooftop "forests" which they afford.

At least one major motion-picture distributor has indicated that he may be willing to furnish films for the proper closed-circuit TV Theatre and others will undoubtedly cooperate when this market becomes active. The same is true of sporting events, and the existing television theatre programs (programs piped solely into theatres) may be made available to home subscribers.

The position of each of the master antenna operators concerned with the closed-circuit TV theatre is explained in the following paragraphs.

The master antenna system operators stand to gain in several ways. First, many people do not wish to pay the charge for connection to the antenna system, preferring to view with indoor antennas. With a special program material available, many of these people will feel it worth while to connect to the system, thus contributing to the operator's main source of revenue. The antenna system operator will, of course, receive a percentage of the gross receipts from coin boxes. His men may install and service the decoders, and collect coins periodically, for both of which he will be paid. In addition, his closer liaison with the viewer will put him in a better position to request and receive the set owners' service business.

The proponents of closed-circuit TV theatre for apartment houses benefit from the antenna system operator because, in effect, the operator is there on the spot; he already has men in the apartment house and has access to the tenants rooms. This means no overhead stemming from employment and movement of collection, installation, and service personel. Responsibility for the customer's installation is not divided. It is concentrated in the antenna system operator.

SECTION IV

THE EFFECTS OF SUBSCRIPTION TV ON THE TV SERVICING AND MANUFACTURING INDUSTRY

Subscription TV and the TV Technician

Whether or not subscription TV is handled locally by franchised distributors, factory-owned subscription organizations, or TV set distributors, there will be a great number of jobs made available to the service technician with the advent of subscription television. Consider the tremendous conversion market for those sets to be equipped with decoders, regardless of which system is finally approved. The technician will have to familiarize himself with

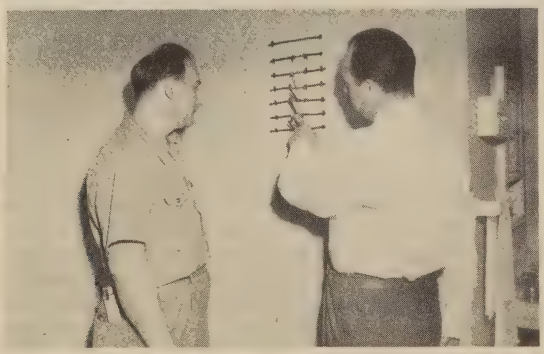


Fig. 64. Mr. Genodman Explaining Splice Connections Used In TV Master Antenna System to a Technician.

hundreds of decoder modification sheets for the various models of TV sets on the market. He will have to install the scramblers without further scrambling of the picture due to the introduction of incorrect circuitry or modified components. The boom to the TV master antenna market will mean that many technicians not now working with master antenna systems will have to be familiar with the master antenna system installation technique. Figs. 64 and 65 show Max Genodman, head of an organization that has installed over 25,000 outlets training a TV technician in how to install master antenna outlets of the type used with the majority of urban master antenna systems.

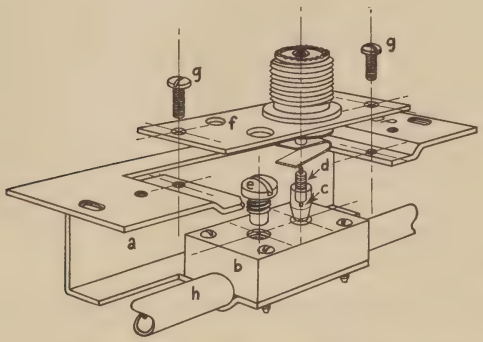
Fig. 66 shows the solderless outlet developed in accordance with the author's patent number 2,615,948 assigned to the Commercial Radio Sound Corporation and used in a majority of RCA master antenna systems. More than 100,000 of these outlets are now in operation and perhaps another 200,000 have been installed which are adaptations or modifications of this outlet device. It is estimated that the individual decoder conversion work and the master antenna

Fig. 65. Mr. Genodman Explaining Technique of Soldering Coaxial Fittings Used in Master Antenna Systems.

system installations may create a market of almost a half of a billion dollars for the TV technician's services alone. However, the TV technician will not have this market on a silver platter. He will have to dig in. He will be required to learn the principles of subscription television, how to separate symptoms originating from a defective decoder from those which originate in other components of the television receiver. He will have to make a real study of the various television receivers to which he must make installations. Of course, he will, as the employee of an organization, receive full training in this new business. What he gets out of this training and how much he will profit from the introduction of subscription TV into the giant television industry, will depend upon himself alone and the effort he makes toward this new business. It is the author's opinion that subscription TV will breed a new classification of TV technician.

This new business will be tremendous in scope and may require a number of technicians to specialize in conversion, installation, service, or any combination of these three categories. It is assumed that the FCC will set up a set of standards in its acceptance of one or more of the subscription TV systems already proposed. It is quite possible that sets of various types will be converted, in quantity, from strictly an economic standpoint.

The individual technician cannot be left out of this picture, as his attitude may control the acceptance of subscription television. The author conducted a survey in 1950 to determine the reaction of potential subscribers for subscription TV tests to be conducted in the New York City area. The potential subscribers were taken from varied backgrounds, in the middle-income brackets or better. They were asked the following questions after the advantages of pay-as-you-see TV were explained to them.



This Coaxial Television Outlet Device consists of the following parts as shown.
a) Frame.
b) Block, complete with four clamping screws.
c) Insulating Bushing.
d) Resistor.
e) Ground Screw.
f) Top Plate Assembly.
g) Top Plate Mounting Screws (2).

Fig. 66. Coaxial Television Outlet Device.

1. Would you like to participate in the subscription TV tests?

2. Would you pay a sum of $1.00 or less for each subscription TV program?

3. Would you pay for the installation of a subscription TV decoder in your home during the test period?

Nearly all the answers to questions 1 and 2 were, with some minor reservations, in the affirmative. The answer to question 3 was for the most part negative, expecially when it was explained that this decoder might have to be removed after a short period of operation.

During this survey the very important position occupied by the TV technician came to light. Nearly all the people who were questioned, asked: (a) Would the subscription TV company unequivocably guarantee the overall performance of the TV set after it was modified? (b) Would the subscription TV company make certain, and in some cases support with a written document, that the potential

service subscriber's service guarantee would not be effected by the modification of their TV sets for the test? (c) In a few cases, the very rough request was made that the subscription TV company guarantee that, after the tests were over, they would pay for set service if it could be proved that the need for repair was due to the previous handling by the subscription TV company's technician. This was the reaction from the very claim-conscious New York TV set owners. No sharp, clear conclusions should be drawn from this survey, as it was such a minute sampling of the TV market, and secondly, in 1950 there were many more sets under contract guarantee than there were in 1954. However, in general discussions with many people, the author has found that the attitude toward set service after a decoder is installed will be one of the major headaches of the subscription TV franchised operator. There is bound to be a problem. An amenable plan must be developed which eliminates a divided responsibility of maintaining a television set with a subscription TV decoder. It is the author's opinion that the franchise subscription TV organization will become major service organizations in order to solve this problem of divided responsibility. Therefore, these franchised subscription TV operators may become some of the largest employers of service technicians.

Subscription TV and the Manufacturing Industry

Consider the number of components which will be sold for the construction of, shall we say, 20 million decoders at, let's say, a cost of $20.00 a decoder. This is almost another half-a-billion dollar market when you consider the replacement parts which will probably be required. This will be another shot in the arm to those engaged in the manufacture of parts and sub-assemblies throughout the country.

Here is another potential bonanza to those who manufacture community antenna systems, master antenna systems, and components for these engineered products. The general expansion in the TV industry from the standpoint of manufactured parts, the boom to the entertainment field, and all those arts and business associated with these two industries, should help make America's economy healthier, happier and more stable.

The tremendous potential success that awaits this new art will certainly disperse those gloomy predictors of doom and depression. It is the American way for science and business to work hand in hand to create solutions for America's financial and economic problems. This is what subscription TV has done and its eventual approval will mean prosperity and happiness for all.